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Contamination of forensic DNA evidence in the light of Hungarian court decisions – A review of 25 years

Gábor Kovács [a,*], Katalin Erdélyi [b], Zsolt Pádár [c], Petra Zenke [d], Mónika Nogel [a]

[a] Széchenyi István University, Győr, Hungary
[b] University of Public Services, Budapest, Hungary
[c] University of Pécs, Pécs, Hungary
[d] University of Veterinary Medicine, Budapest, Hungary

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ABSTRACT

The evaluation of forensic DNA expert opinions (in some countries expert witness testimonies) and the way it affects criminal judgement is of paramount importance. We have selected one of the largest challenges when it comes to the evaluation of forensic DNA evidence, contamination of DNA samples, and examined how it influences the decisions judges make about the credibility of DNA evidence in Hungary.

1. Introduction

The robust science and the evidential significance of DNA evidence in many criminal cases have established it as a "gold standard" [1] in forensic science since DNA analysis is a powerful tool and often the only one for establishing the presence or absence of someone at a crime scene. However, DNA evidence can be contaminated when DNA from another source gets mixed with DNA relevant to the case, and the contamination of the sample may be responsible for associating an innocent person with the crime. Several examples support the correctness of this statement: the Amanda Knox murder trials [2], the story of the Phantom of Heilbronn [3], etc.

In a forensic setting, contamination can come in many forms and via different vectors. For instance, a police officer at the scene, a scientist examining the evidence, a dirty examination tool, a dirty crime scene bag, a non-DNA-free reagent used during sample analysis, work at mortuaries can all be causative factors [4]. If DNA evidence is properly collected from the scene, packaged and handled correctly during transportation and storage, and decontamination procedures are used, the potential for contamination will be greatly reduced [5]. It is obvious from the literature and practice that the protocols for preventing DNA contamination are essential to avoid miscarriages of justice. Or, if the contamination has already happened, there is a need for guidelines that help to identify it [6]. Although there is great awareness concerning the issue of contamination and best practice procedures to avoid it in forensic laboratories in Hungary, the techniques for collecting and handling evidence outside the lab have not been updated in last two decades. In fact, while the issue of contamination and its potential effect on investigation and trial is a frequently discussed topic in international literature [7–9,13], relatively little is said about this in Hungary. The focus of this study was, how DNA sample contamination affects criminal trials in Hungary, and how often are forensic DNA opinions excluded from the criminal cases because of contaminated samples, or at least because of a claim that the samples could be contaminated.

2. Method

The collection of Hungarian court decisions is available online in Hungarian language (https://eakta.birosag.hu/anonimizalt-hatarozatok). At the time of our study (April 2022) the database contained 185.000 anonymized verdicts. Our study covered criminal judgements between 1996 and 2021 which involved a review of 29.409 cases. We used the search engine on the web interface of the database to sort the judgements. We reached the relevant keyword search and multiple narrowing. The text files created as a result of the selection were converted into semi-structured text corpus using the office interop word algorithm. We ran the queries on these, the results of which form the findings of our study.

3. Results

We have found that only 2181 cases from 29.409 were concerned

* Corresponding author.
E-mail address: bunugyi@gmail.com (G. Kovács).

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with the results of DNA analysis in the past 25 years. The word, contamination" and its synonyms in relation to DNA evidence were mentioned only in 50 cases. However, the detailed examination has shown that from the 50 cases where the searched keywords were found only three cases were relevant from the point of view of our study (Fig. 1).

As for the rest:

- in eleven cases the judgement contained claims about mixed-DNA,
- four judgements contained claims of primary or secondary transfer,
- six of them were about improper handling and/ or storage where the biological traces were destroyed and were not suitable for DNA analysis,
- in some cases, the unprofessional behavior of the staff arriving to the crime scene was criticized but the reference to sample contamination itself did not come up, and
- in the remaining cases there was a false positive match for the searched keywords.

The latter factor gives rise to the conclusion that the database's search engine is not completely accurate. This can be identified as a limitation of our research.

4. Discussion

In Hungary, the judge is the one who decides about the credibility and acceptability of the forensic DNA expert opinion. The judge should justify his/her resolution in written form [10]. To examine, whether the issue of DNA sample contamination is a frequent topic in criminal cases in Hungary, we have run a search in the database of anonymized judgements. The number of cases in which the possibility actually arose in court fell short of our expectations, since only three cases dealt actually with this phenomenon. Systematic examination has shown, that the argument on the contamination came exclusively from the side of the defense. Based on analytical review, it can be concluded that even if the judges accepted the argument that the possibility could not be excluded that the sample was contaminated, substantive evaluation of this plea was rare, and the final decisions were never influenced by these objections.

Since a DNA sample can be contaminated in the collection process; the process of preparing; the process of storage; testing DNA samples are prone to laboratory error; and the interpretation of the results of analysis is a human activity, we cannot deny the possibility that forensic DNA expert opinions sometimes could be based on sample that had been contaminated [5,7,12]. Strict protocols in forensic laboratories help prevent contamination, however, contamination most often occurs before the sample reaches the laboratory. Courts should be aware of this circumstance, and in any case, they should carefully consider the propositions on which it may arise that the biological sample was contaminated. Otherwise, the credibility of the forensic DNA expert opinion will not be examined in depth, which can lead to wrongful conviction. It is surprising that the issue of contamination was raised in only a negligible number of cases in Hungary. Also, doubts arise as to whether law enforcement officers and judges have an adequate depth of knowledge about the nature of DNA, its sensibility, transferability, and persistence. It cannot be ruled out that the impact of possible contamination on the expert opinion was underestimated. This raises the question of whether the principle of *in dubio pro reo*[1] has not been violated.

5. Conclusion

There should be awareness that contamination is also possible also outside the criminal laboratories and that accreditation of forensic DNA laboratories [11] alone cannot rule out the possibility of contamination. Education and training for law enforcement is required to ensure the proper handling of evidence from scene to storage and ultimately, reducing the risk for contamination as well as the impact of these issues upon the outcome of a criminal investigation. Judges should examine, whether policies and legislation on the collection, retention, and use of DNA were followed in every single case. If the possibility of contamination arises, they must examine the objection with particular care. In order to be able to perform the deep examination of forensic DNA expert opinion correctly, judges need to acquire broader knowledge about the properties of genetic evidence. Understanding the limitations of DNA analysis may help identify specific strategies to improve the contribution of forensic DNA analysis to the criminal justice system.

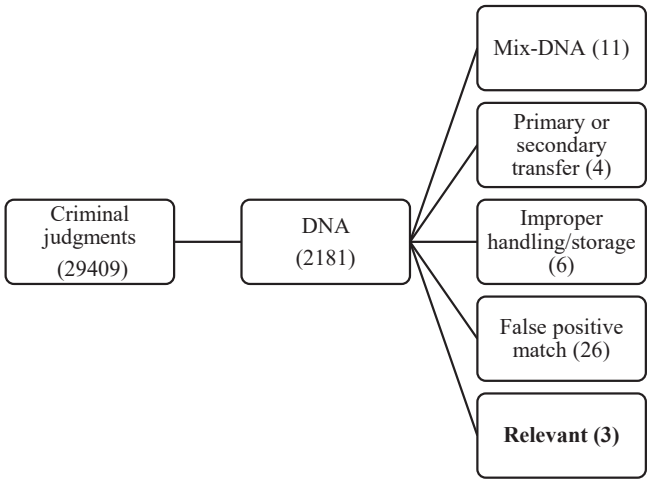

Fig. 1. Result of the detailed examination of the 50 cases where the searched keywords were found.

Conflict of interest

None.

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[1] Latin for "[when] in doubt, rule for the accused".

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