

Katarzyna Ćwik, M.A.

Graduate of the Police Academy in Szczytno

Ph.D. student at the Department of Criminalistics and Forensic Medicine

Law and Administration University of Warmia and Mazury in Olsztyn

katarzyna.cwik1992@wp.pl

Elimination DNA database – an opportunity or a threat? A review of the functioning of elimination databases in selected countries

Summary

One of the basic provisions laying down the rationale for the functioning of elimination DNA databases is the 20th recommendation of the European Network of Forensic Science Institutes - ENFSI, set out in the document entitled: "The DNA Database management. Review and recommendations", developed by ENFSI DNA Working Group. The recommendation states clearly that each DNA database should also include an elimination database(s) containing the profiles and data of persons who may have been the source of the so-called cross-contamination of traces being the subject of analysis.

The purpose of this article was to illustrate the essence of functioning of elimination DNA databases on the example of selected countries, with particular regard to, among others, system solutions applied, directories of persons subject to registration, legal basis and the number of contamination events detected as a result of database querying.

A bibliographic query and analysis of source materials and foreign procedures enabled the author to present system solutions and the basics of functioning of selected elimination DNA databases established worldwide. Moreover, the author emphasized the importance of elimination databases as a tool for identifying the offenders and highlighted certain opportunities and risks involved in their implementation.

Keywords: contamination, elimination DNA database, forensic genetics, evidence, legislation

Introduction

Due to its complexity, the issue of developing and functioning of forensic databases has been historically sparking debates among forensic theoreticians, analyzing the establishment and implementation, and the practitioners responsible for routine operation thereof. The references to the initial entries into quasi forensic databases have already appeared in Antiquity, the Middle Ages, as well as between the 18th and 19th century, when the so called "acta nigra" appeared, and when the prototypes of anthropometric systems and registries were developed by such pioneers as Alphonse Bertillon or Francis Galton (Thorwald, 2009). At that time, the idea behind developing forensic registries was, as prosaic as it sounds, to single out and identify the factual perpetrators of criminal acts. Nothing has changed in this respect until these days.

Forensic DNA database is a source of non-procedural information and an indispensable tool

supporting the work of the Police and other law enforcement authorities. It serves not only the purpose of identifying crime perpetrators or the links of a particular person with crimes committed earlier, but also facilitates the identification of persons of unknown identity or attempting to conceal their identity, unidentified human decedents, persons wanted by law enforcement authorities or those sought after, who have been declared missing. Currently, the following genetic profiles are registered in the national DNA database: unidentified traces, unidentified decedents, persons of unknown identity, suspects, minors, missing persons, and, since recently - family members of missing persons, which category has contributed to a noticeable increase in the identification of unidentified decedents, whose genetic profiles were registered in the database. Additionally, genetic profiles obtained as a result of forensic analysis of traces recovered at the scene of the crime are registered, especially

when they cannot be attributed to a particular person. Owing to strict legal regulations and the procedures of the quality management system, DNA database allows singling out crime perpetrators on a daily basis, which accelerates the identification process and, to a significant degree, ensures the implementation of the principle of the economics of criminal proceedings.

As stated above, cataloging and automatic searching performed within forensic databases, as well as transmitting information via national and international networks, support the cooperation between law enforcement authorities in terms of singling out crime perpetrators, however, at the same time, these activities can create certain risks for persons, whose personal information is to be processed, especially in the context of the development and functioning of elimination DNA databases. An important aspect within this area became the storing and processing of information on genetic profiles of not only persons who are in conflict with the law, but also personnel of forensic laboratories, in particular those who might have come in contact with the test material at any time point between crime scene examination and forensic analysis, followed by the issuance of an opinion.

This article describes the functioning of elimination DNA databases on the example of selected countries (both members and non-members of the European Network of Forensic Science Institutes - ENFSI) with particular regard to, among others: system solutions applied, directories of persons subject to registration, the legal basis and the number of detected events of test material contamination. It is important to highlight that this article is not a comprehensive review of the complex issue of the role and methods of implementation of elimination DNA databases, but merely a synthetic presentation of fragmentary query results, analysis of source materials and foreign procedures carried out as part of the author's own research conducted with a view to preparing a qualifying assignment (Ćwik, 2016).

Elimination DNA database – introductory issues

Nowadays, an elimination DNA database serves as a quasi tool, supporting forensic DNA databases. It provides invaluable assistance in detecting the sources of test material contamination as well as in accelerating the process of perpetrator identification (Branicki et al., 2008).

The discussion on the substance and principles of functioning of elimination DNA databases *sensu largo*, should be initiated by pointing out one of the main provisions justifying the development of such databases, namely the 20th recommendation of the document entitled: "DNA Database management. Review and recommendations", elaborated by ENFSI DNA Working Group (ENFSI DNA WG, 2016). The

recommendation stipulates directly that each DNA database should have an associated elimination DNA database(s), containing the DNA profiles of persons who could introduce cross-contamination to the investigated traces. The provision in question also stipulates that elimination DNA databases of ENFSI-member countries should obligatorily contain DNA profiles and information on all laboratory personnel, including cleaning staff and visitors (external customers). Additionally, the elimination database resources should encompass the data of persons participating in the chain of custody. The above applies to anyone, who came into direct contact with the test material, whether in the course of on-site examination (police officers, prosecutor, etc.), storage, registration or transport processes. It is equally important to collect unidentified DNA profiles found in the so called "negative controls", the presence of which can be the result of using disposables and/or chemical substances (according to ENFSI recommendations, any information relating to this category should be shared with other ENFSI-member countries as part of international data exchange).

Moreover, the recommendation stipulates that the national forensic laboratories should create their own internal elimination databases collecting employees' profiles. As of April 2016, a new provision has been introduced, stipulating that employers may include the willingness to be included in the elimination database as a requirement for a particular job. Furthermore, it has been stressed that no specific legal basis exists for the establishment of an elimination database. Therefore, the countries which make an effort to create such databases, shall be bound by their national data protection laws or, in some cases, the provisions of the Police Act.

In the light of the foregoing, this article focuses on selected countries (ENFSI members and non-members), in which elimination DNA databases have been launched (with the exception of Kuwait, in which case the global nature of the national DNA database was highlighted). The countries to be presented were not chosen in a random manner, since they represent a different approach to the problem, system solution or legal basis for the implementation.

the Netherlands

The objective of the elimination DNA database established in 2002 at the NFI (Nederlands Forensisch Instituut) is to detect inadvertent contamination of genetic material by persons who may have had direct or indirect contact with such material. For this purpose, any DNA profile to be entered into the national DNA database is previously compared against the elimination DNA database. If the comparison yields a match, the cause is analyzed in order to prevent the occurrence of similar situations in the future.

The Dutch elimination database collects genetic profiles derived from:

- 1) laboratory staff
- 2) cleaning-maintenance staff;
- 3) police officers present at the scene of the incident;
- 4) contaminations of unknown origin and originating from negative controls;
- 5) control samples;
- 6) visitors (external customers).

In the case of a positive hit, the internal laboratory procedures assume two situations:

- A) an indication of the profile of a police officer as a source of contamination;
- B) an indication of the profile of a laboratory employee as a source of contamination.

In the first case, a laboratory analyst working at the national DNA database prepares a report indicating that the match with the policeman's genetic profile has been obtained, and asks his parent unit to provide a written explanation of the situation. In the absence of a reply within 14 days, the system displays the message: "No feedback received". In the absence of a feedback, the analyst asks the prosecutor leading the case about the possibility of removing the policeman's profile from the national DNA database and draws up a report indicating this profile as the source of test material contamination. The above procedure does not contain information about the possible consequences for a policeman who caused the contamination.

In the second case, a laboratory analyst working at the national DNA database prepares a report indicating laboratory employee as a source of contamination and individually contacts the employee's parent laboratory (on December 5, 2013, a proposal was accepted to include the copies of DNA databases operated by other national laboratories into the NFI elimination DNA database). The contamination is analyzed in accordance with the procedures of the laboratory employing the analyst who was the source of contamination or, in the case when the profile was removed from the database, only at the request of the unit in which the analyst is employed. As in the previous case, the report is drawn up indicating this profile as the source of test material contamination. In view of the above, it should be noted that in the case when forensic laboratory operates its own elimination database and the police officer or laboratory employee is identified as the source of contamination, such a profile is not transmitted to the National DNA Database. In addition, it is possible that a profile generated by a particular laboratory will match the employee of another laboratory. In such a case, the processing occurs in accordance with the above rules or, if necessary, it involves both laboratories. The above procedure also does not contain information about the possible consequences for a laboratory employee who caused the contamination.

As stated in the 20th recommendation cited above, the legal solution is based on the personal data protection act, however, it was to some extent supplemented by internal laboratory procedures, called the DNA law. In practice, the principle *lex specialis derogat legi generali* (special law repeals general laws) applies, which means that the indicated legal bases are complementary to each other, however, in matters not regulated, the internal procedures shall prevail. The basis for the collection of personal data, including the genetic code, is set out in Article (Section) 23 par. 1a of the Dutch Personal Data Protection Act, which provides that: "*without prejudice to Articles (Sections) 17-22¹, the prohibition on processing of personal data referred to in Article (Section) 16², does not apply in so far as this is carried out with the data subject's explicit consent*". It follows from the foregoing that the registration of a genetic profile is allowed only with the written consent of a registration subject (voluntary basis). Moreover, the person subject to mandatory registration shall be informed about the purpose of registration and the conditions of sample donation. Only certain incentives towards sample donation are allowed. Hence it is necessary to raise awareness of law enforcement representatives about the idea and usefulness of elimination DNA database in detecting offenders.

The Dutch Minister of Security and Justice, Ard van der Steur took a position on an issue of voluntary registration in elimination databases by stating that police experts and forensic technicians who refuse to donate their DNA samples to elimination DNA database can be potentially excluded from handling casework in the future. As it turned out, the above approach is incompatible with Article 10 of the Constitution of the Kingdom of the Netherlands of March 28, 1814, which clearly emphasizes that everyone has the right to respect for their privacy, and consequently, that no one can be coerced, inter alia, into donating their DNA samples. However, in the minister's opinion, there is a legitimate concern as to the participation of unregistered officers in criminal cases. Furthermore, he stressed that the situation in which elimination DNA

¹ Articles (Sections) 17-22 of the Dutch Personal Data Protection Act indicated in the text regulate the issues related to the abolition of prohibition on processing personal data, included in Article (Section) 16 of the said Act [own translation].

² Article (Section) 16 of the Dutch Personal Data Protection Act indicated in the text provides for the prohibition on processing personal data concerning a person's religion or philosophy of life, race, political persuasion, health and sexual life, or personal data concerning trade union membership. This prohibition also applies to personal data concerning a person's criminal behavior, or unlawful or objectionable conduct connected with a ban imposed with regard to such conduct. [own translation].

Increase in the number of samples provided by the Dutch police officers for elimination purpose in the period from 01.01.2013 to 13.02.2015

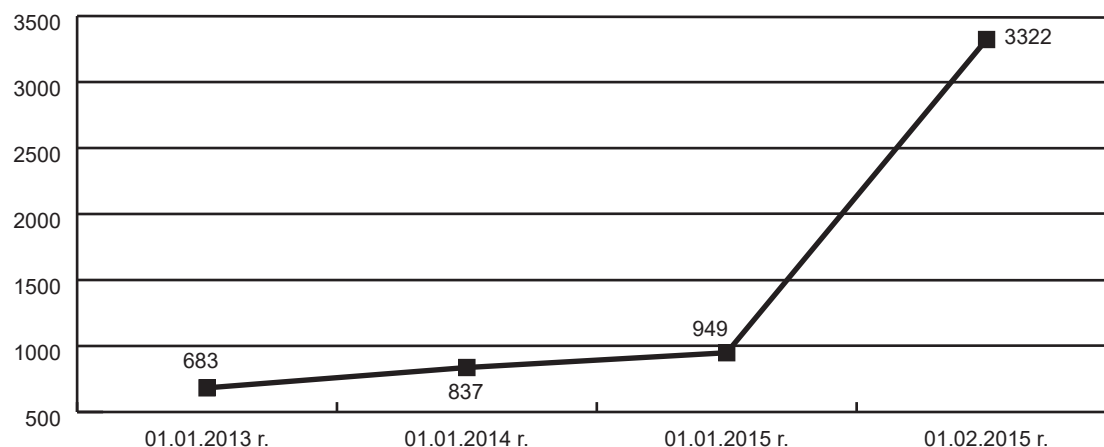


Fig. 1. Increase in the number of samples provided for elimination purpose.

database would not contain the profiles of all police officers would be entirely undesirable.

Numerous discussions about the voluntary donation of samples of genetic material to elimination databases resulted in an increase in the awareness of representatives of law enforcement authorities. Above all, police officers performing duties at the scene of the incident were from year to year more likely to donate their genetic material for the purpose of elimination (fig. 1).

To conclude deliberations on the functioning of elimination DNA database in the Netherlands, it should be noted that the essential basis for its implementation lies in the complementarity between the provisions of the Act on the protection of personal data and internal laboratory procedures. The directory of entities subject to registration in this database is so extensive, that also takes into account the profiles obtained from negative controls, control samples and from the visitors (customers). Additionally, a very interesting solution has been implemented, consisting in obtaining the copies of databases operated by other national laboratories, including those intended for liquidation. This is an interesting approach, especially in the context of augmenting resources of an elimination database, thereby increasing its capabilities in terms of predicting the sources of contamination and reducing its occurrence in the future.

Austria

Along with technological progress and, what follows, the appearance of more sensitive DNA amplification kits on the market, the chance of detecting test material contamination increased significantly. At

the same time, also an increase in the number of possible methods for the detection of undesired contamination of evidentiary samples was observed. In order to estimate the country-wide percentage of contamination of biological traces, the Austrian laboratory at the University of Paris Lodron in Salzburg conducted a very interesting study (Pickrahn et al., 2015), comparing the number of biological samples secured at the site of the incident and analyzed in the laboratory, against the number of detected cases of contamination of the same material. In 2000, the samples given voluntarily by the representatives of law enforcement authorities performing on-site duties were compared against forensic traces secured at the same sites. In the period 2000-2009, 90 cases of contamination were detected among 25 000 samples tested. Thereby, the problem of the occurrence of test material contamination originating from persons who have been in contact with genetic material was noticed, which prompted preparations for the implementation of an elimination DNA database. One of the main obstacles was the lack of legal regulations in terms of the legality of sampling for the purpose of elimination. In view of the above, the process of developing legal regulations was initiated, in consequence of which the Police could begin a nationwide registration of DNA profiles for elimination purpose.

Consequently, since 2009, a national DNA database collects, inter alia, genetic profiles of police officers. A collection of these profiles is referred to as the Police Elimination Database (PED), whose legal basis, in the case of Austria, was laid down in § 70, Clause 4 of the Police Act, stipulating that: "Pursuant

to §65, clause 2³ and § 67, clause 1⁴, law enforcement authorities can collect biometric data belonging to their representatives, including fingerprints and other data enabling the identification (§ 65 (6))⁵, if there is the possibility of determining the circumstances of the incident. The use of such data for other purposes is unacceptable.” In this context, another important provision of the same law is § 67, Clause 2, stipulating that: “Genetic information that was determined in the course of analyses can be used only and exclusively for the purposes of law enforcement authorities. Molecular genetic analysis is used for the customer’s purposes and biometric identification information obtained in this way cannot be made available for other purposes.”

The issue of a directory of persons subject to registration remains complex because of the fact that the elimination database established at the Austrian national DNA database is operated, inter alia, by four laboratories (in Vienna, Salzburg, Graz and Innsbruck), belonging to a group of Austrian institutes of forensic medicine. In view of the above, there are different searching and data storage levels, which are dependent on the purpose and legislation in force. In general, the following directories of persons subject to registration in an elimination database are recognized:

- a) Genetic profiles of laboratory staff—this directory contains profiles originating from employees of four Austrian laboratories mentioned above, which are stored in local elimination databases operated by those laboratories;
- b) “Accidental persons”—persons who are not suspicious, but their DNA profiles or fingerprints could have been erroneously secured as traces originating from the site of the incident (e.g.,

victims, owners of items touched by the offender, rescuers, including firefighters, medical personnel, etc.). Such persons are registered temporarily and solely for the purpose of elimination;

- c) Police officers—this directory contains DNA profiles and fingerprints originating from police personnel. Generally, in accordance with the legislation in force, these data are stored and used for the purpose of elimination for as long as a particular police officer remains in service and has an opportunity to deposit his genetic material directly on-site or on secured evidence. What is important, the data are stored separately in DNA and AFIS elimination databases.

In Austria, the approach described above is considered useful, however, as a result of numerous discussions and negotiations with police trade union at the stage of designing the Police Elimination Database, the Minister of the Interior agreed that the implementation will take a form of a two-step process. This specific and raising many controversies Police Elimination Database functions on the basis of a match between the procedures (legal aspect) and certain kind of filtering (technical and organizational aspect), at the national level, applying to all currently and previously registered forensic traces from Austrian territory.

In the event of a match between a given profile and the profile originating from the Police Elimination Database, such a hit is further confirmed and verified in terms of its possible contamination origin. It should be borne in mind, that police officers can also be the offenders and, therefore, the hits are never automatically deleted. The verifications are performed by specially trained and responsible heads of nine regional units, dealing with widely understood site of the incident. They are also responsible for delivering trainings in the field of work at the site of the incident to all forensics technicians employed in these regional units. The results of the inspection, including information on possible contamination events, are only made available to the police officers concerned. Their supervisors and the Prosecutor’s Office receive an anonymous message about the hit, only informing that a “random person” matched trace evidence secured on-site. The above procedure does not contain information about the possible consequences for a policeman who caused the contamination. Furthermore, it is not possible to provide personal data of the officers (even despite demand from the responsible prosecutor or court). The refusal to share personal data is governed by the existing Austrian legislation, however, in the case when an elimination database query raises the suspicion that the officer could have committed the offense, then his personal information is reported to the immediate supervisor, and the officer is held liable on the basis of separate provisions. It should be remembered that donating samples to the elimination database does not

³ Paragraph 65, Clause 2 of the Austrian Police Act stipulates that the law enforcement authorities shall be authorized to collect dactyloscopic data of persons who are not suspected of committing a crime, but could have deposited their traces at the site of the incident, which is an indispensable part of a proper evidence assessment [own translation].

⁴ Paragraph 67, Clause 1 of the Austrian Police Act stipulates that collecting fingerprints, based on which a DNA profile can be determined, shall be permitted if a person is suspected of committing a crime punishable by imprisonment for a term of at least one year or if the nature of the prohibited act or the offender’s personality raise concerns about the possible repetition of the offence. Where necessary, this procedure additionally applies to persons mentioned in §65, Clause 2 and §65, Clause 4-6 (referring to persons participating in analyses) [own translation].

⁵ Paragraph 65, Clause 2 of the Austrian Police Act stipulates that the law enforcement authorities shall be permitted to collect data such as current and previous names, gender, date and place of birth, nationality, parents’ names, dates, issuing authority and serial number of an identity card as well as other data which require special protection (sensitive), in order to protect the country’s vital interests and achieve successful identification [own translation].

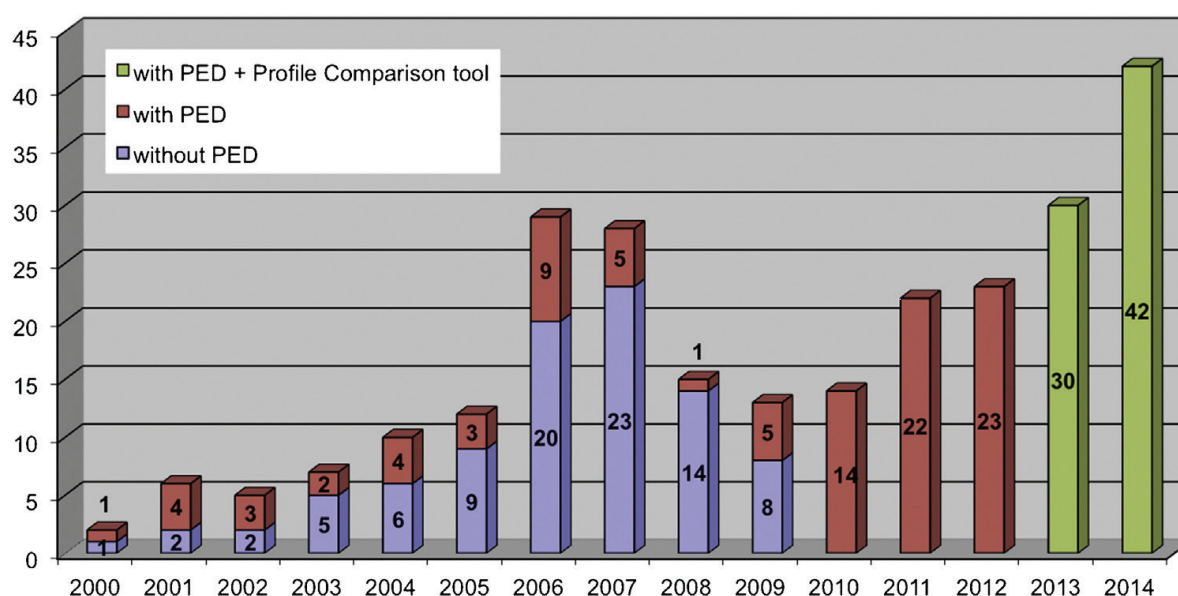


Fig. 2. Detected events of test material contamination in the period 2000–2014.

immediately translate into the “criminal immunity” for those who voluntarily provided their genetic material.

The establishment of the Police Elimination Database undoubtedly contributed to increasing the detectability of test material contamination (fig. 2). However, bearing in mind the above, it should also be concluded that the increase in the number of detected contamination events does not indicate poor laboratory performance, but, to the contrary, the relevance and effectiveness of a new solution, which is undoubtedly the extension of the national DNA database to include elimination database. A study carried out by Austrian specialists revealed that the establishment and subsequent upgrading of the Police Elimination Database have contributed to improving the quality of laboratory work.

Both in the case of the Netherlands and Austria, a key role is played by the principle of voluntary registration, which has helped to detect numerous cross-contaminations of genetic material and, at the same time, has initiated legislative changes to the Police Act, which has led to the successful implementation of the Austrian Police Elimination Database.

Canada

In the Laboratory of Forensic Sciences and Forensic Medicine in Montreal (LSJML) – a fully accredited regional laboratory, independent of the Canadian police in Quebec – a study was conducted and a method developed, which contributed to a significant increase in voluntary registration of DNA samples. As shown in the article by Lapointe, Rogic, Bourgoin, Jolicoeur and Séguin (2015), the idea behind the project was to carry out 30 information sessions in the years 2010–2012. The problem encountered by Canada as an ENFSI

non-member country, was a low number of samples registered for elimination purpose. Therefore, the laboratory has focused on the search for a solution that could change this situation.

Between the end of 2010 and the end of 2012, forensic geneticists along with laboratory managers conducted information sessions in different regions of Quebec, intended to distribute information about the elimination DNA database. The sessions focused on raising awareness among the audience, by presenting the purpose of a database and its relevance for the identification process. The lectures were additionally supplemented with presentations of real cases of genetic material contamination, and provided, inter alia, a detailed description on how the laboratory ensures the protection of personal data (including optional anonymity) of all persons who donate their samples. An essential element at the end of each session were voluntary donations of samples by all participants.

Owing to their consistency, the information sessions as well as raising awareness of law enforcement representatives resulted in an increase of the number

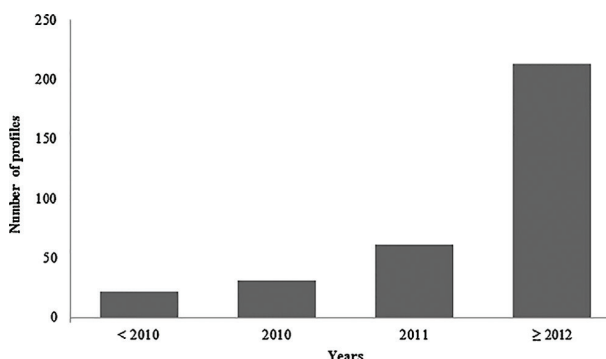


Fig. 3. Increase in the number of samples obtained owing to the implementation of information sessions.

of samples submitted for registration, from just over 50 to 327, in 2012 alone (fig. 3). It is worth emphasizing how important from the point of view of the functioning of an elimination DNA database is educating the potential donors about the usefulness of this tool in the identification process, and how its absence negatively affects the efficiency of the laboratory and, consequently, the principle of economics as it pertains to criminal proceedings.

The essence of the functioning of the Canadian DNA database is based on three basic criteria:

- 1) Elimination DNA database is entirely independent from the Canadian national DNA Database (NDNAD), the government computer network of Quebec and the Quebec Police Department;
- 2) All persons whose samples are to be registered have the option to remain completely anonymous. The profiles are assigned an individual reference number and the identity of the "owner" of a sample is only known to the police officer designated for a particular area;
- 3) Persons whose profiles are registered in the database have at any time the right to request that their personal information, samples and genetic profiles determined based thereon be completely destroyed. These persons shall be immediately informed about the efficient destruction of their material and information listed above.

The procedure for searching and storing DNA profiles does not appear to be complicated. After receiving and preliminary processing of samples, the obtained genetic profiles are in the first place compared against all unidentified profiles of the national DNA database (NDNAD). This preliminary comparison allows determining whether any contamination events could have been the cause of the still ongoing or unsolved cases. If any profile of unknown origin is matched with the profile of a person who worked at the scene of the incident, it is permanently removed from the national DNA database. Moreover, the profile of such a person is never again registered in the national database, but is remains stored in the elimination database for the purposes of current and future investigations, especially in cases, where a material contamination was detected. It is noteworthy that, as part of its quality control system, when contamination is detected, the laboratory performs routine quality checks, to determine the chain of events that led to contamination and develop measures to prevent the occurrence of similar cases in the future. The authorities overseeing the work of employees participating in an on-site examination, whose genetic profiles were detected, are immediately informed of the occurrence of contamination and its circumstances. This information relates to any contamination event and it includes, among others: the type of case, evidence involved or samples secured, and the quantity of DNA obtained

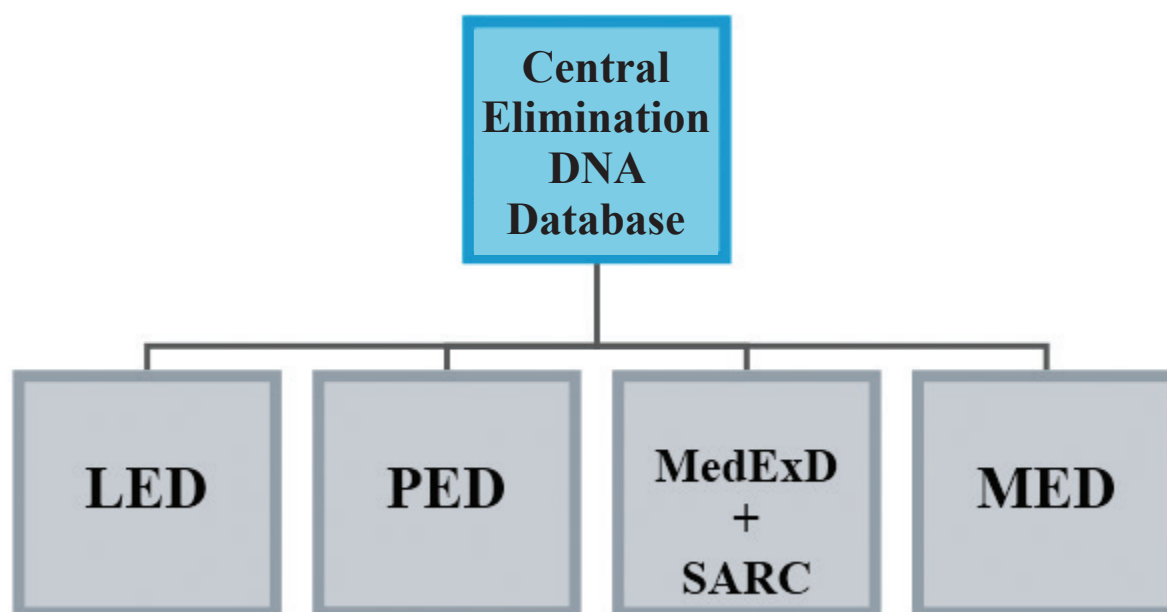
from each case of contamination. When a profile of a person working on-site gets disclosed, for example on items coming from the place of the event, forensic geneticists from the laboratory in Montreal inform the supervisor of such a person of that fact. After having considered all the evidence gathered in the case, the supervisor decides whether further action or laboratory analyses are required. The above procedure does not contain information about the possible consequences for a person who caused the contamination.

Since the time when the laboratory in Montreal ceased to be the police laboratory, its staff has not been directly involved in police investigations and cannot undertake any activities extending beyond laboratory quality control process. However, the staff can collaborate with police forces towards identifying and understanding the causes and mechanisms of contamination of genetic material. This is a very desirable activity due to the fact that forensic geneticists, who deal with the phenomenon of contamination on a daily basis, are much better to explain to other people working at the crime scene, which contamination events to pay attention to, how can they occur and what difficulties can they cause in the context of laboratory analyses.

Also in the case of Canada, the principle of a voluntary transfer of samples for elimination purpose is applied. An essential issue in Canada, was not the lack of regulations in terms of the legality of the elimination database, but a low rate of sample donation. It is impossible, after all, that the database in which the data are missing or are insufficient for allowing the reduction of the phenomenon of test material contamination and the effective detection of the offender, could function properly. In the light of the above, it is important to emphasize that, aside from the legislative and technical solutions, equally important (and, in some cases, even crucial) is the process of raising awareness among law enforcement representatives about the indispensability of an elimination database in the offender identification process.

United Kingdom

Compared to the characteristics of the elimination databases in other countries, the structure of the UK database resembles an elimination sieve. Showing great creativity, and the predictive abilities, the British, have created a complex structure of the database as a tool that has the ability to analyze any potential sources of contamination. By analyzing source materials as well as the procedures regarding the functioning of the UK elimination DNA database, the author concluded that its whole mechanism is based on the so-called Central Elimination Database, made up of a few subbases (LED, PED, MedExD and SARC, MED), containing extensive directories of the potential sources of contamination of genetic material (fig. 4).



LED – Laboratory Elimination Database, PED – Police Elimination Database, SARC – database of the Sexual Assault Referral Centre, MedExD – Medical Personnel Elimination Database, MED – Manufacturers Elimination Database.

Fig. 4. Model organizational structure of a Central Elimination DNA Database in the United Kingdom.

Laboratory Elimination Database (LED) contains genetic profiles and reference samples that can be used exclusively for purpose of elimination (ISO/IEC 17025 item 4.9 and 4.12). It encompasses genetic profiles and data originating from:

- a) secured forensic evidence;
- b) laboratory staff (including employees directly involved in DNA processing);
- c) contractors and external customers;
- d) unidentified sources of contamination (including genetic profiles of unknown origin, in particular obtained from the so-called negative controls and periodic in-service tests (ISO/IEC 17025 item 4.9)).

It should be stressed that a precondition for employment of new laboratory staff members is obtaining their written consent for the donation of a DNA sample for elimination purposes. As regards employees whose previous employment contract (i.e., concluded at the time when registration for elimination purposes was not in effect) did not contain a clause referring to the written consent for DNA sample donation for elimination purposes, their conditions of employment are to be altered, after previous consultations, in such a way that the sample donation becomes obligatory for a given job position.

Police Elimination Database (PED) contains genetic profiles and data originating from:

- a) police staff belonging to the so-called high-risk groups, including:

- 1) all the persons involved in the activities at the scene: investigators, forensic technicians, experts, etc.;
- 2) personnel participating in processing evidence, both at the scene and in the forensic laboratory, before preparing material for DNA analysis;
- 3) police officers who participated in securing evidence;
- 4) prison guards and others, who receive and process evidence in detention centres, including persons who collect buccal swabs from the detainees with the purpose of registering their genetic profiles in the national DNA database;
- 5) personnel participating in processing unpacked evidence, including traseological traces and screening tests.

It should be added that the law enforcement authorities are obliged to ensure that all employees within the so-called high risk group have donated their samples for the purpose of elimination. Interestingly, persons who do not appear in the Police Elimination Database (PED) and have not provide their samples on a voluntary basis, are transferred to the so-called low-risk group or their conditions of employment are altered, after prior consultation, in such a way that their inclusion in the elimination database is no longer obligatory for a given job position.

- b) police staff belonging to the so-called low-risk group;

Police personnel not meeting the criteria of a high-risk group (e.g., police patrol members) are categorized into the group, where the risk of contamination is lower

but not completely excluded. The profiles of such persons are, as a rule, not subject to registration in the elimination database, unless specific circumstances arise, for example, when a police officer is involved in on-site activities, not as part of his daily duties, but due to the need of undertaking urgent activities on an ad hoc basis.

c) non-police personnel;

In the UK, it was recognized that there are additional groups of non-police employees, who, through their roles and duties can also pose a risk of contamination of genetic material. Although storing profiles of non-police personnel seems to be out of proportion, it is recommended that they be routinely collected in the event of an inability to localize the source of contamination. In view of the above, the following categories have been included:

- 1) workers dealing with recovery of stolen vehicles;
- 2) paramedics, physicians, emergency service workers;
- 3) support staff, e.g. cleaning-maintenance workers, security staff;
- 4) employees who do not directly participate in genetic analyses, however, come in contact with the material, which later might be the subject of DNA analysis.

Medical Personnel Elimination Database (MedExD) and the database of the Sexual Assault Referral Centre (SARC) contain genetic profiles and data originating from:

a) medical personnel;

This group includes all persons who, in the course of their activities use autopsy and examination rooms as well as other rooms intended for evidence recovery and analysis.

The following directories are included herein:

- 1) all employees of the Sexual Assault Referral Centre (SARC), i.e., physicians, emergency response and cleaning staff, family members and friends of the victims, who may be present during the medical examination at the victim's request;
- 2) all employees of the autopsy facilities, in particular, pathologists.

Manufacturers Elimination Database (MED) contains genetic profiles and data originating from:

a) manufacturing personnel providing materials for collecting and preserving DNA samples;

All entities involved in the processing and analysis of evidence should use materials and tools that are free of detectable human DNA and satisfy the requirements of the PAS 377:2012 standard. Specification for consumables used in the collection, preservation and

processing of material for forensic analysis is included in the ISO/IEC 18385:2016 standard, which provides requirements for minimizing the risk of human DNA contamination in products used to collect, store and analyze biological material for forensic purposes. In addition, manufacturers and assemblers of laboratory materials and kits establish and update their own elimination DNA databases, containing genetic profiles of all employees who have access to the company's facilities, thereby posing a risk of contamination of consumables with own genetic material. Their data can be stored in an anonymous form, however, an open list of employees should be available for persons operating an elimination database.

This solution allows precise indication of the source of contamination, which undoubtedly makes it easier to implement corrective actions in order to avoid similar situations in the future. The contamination risk assessment process is also intended to determine the range of persons subject to registration in the elimination database, e.g. to include employees who have direct contact with the product and exclude those, who only deal with its distribution. In special cases, registration is also extended on the staff involved in the delivery of raw materials used in the production process.

The British pay particular attention to the Police Elimination Database (PED). As a result, a special quality policy has been developed in the UK with regard to the use of the PED, which takes into account the implementation of the following objectives:

- 1) educating police employees on the scope of applicability and use of the Police Elimination Database;
- 2) informing laboratory staff about detected contaminations, whose source were police officers;
- 3) encouraging the voluntary provision of samples of genetic material.

A priority rule applicable in the PED management process provides that the profiles of persons belonging to the so-called high-risk group should be searched automatically and routinely, before conducting a query in the national DNA database. Regardless of which subbase covered a person being the source of contamination, once it is identified, a final report is drawn up that includes information about the subbase from which the contaminant profile originated (e.g. police, laboratory, etc.), the probable circumstance of contamination (e.g., laboratory analysis, manufacturing process, etc.) and the place of its occurrence (e.g. laboratory, place of the incident, etc.). The above procedure does not contain information about the possible consequences for a person who caused the contamination. The British practice reflects an exceptionally high level of an elimination database management, and the UK can serve as an ideal example of a country in which the problem of contamination of

genetic material has been approached successively and on many levels.

Kuwait

Kuwait's policy of developing a global DNA database for registering the profiles derived not only from the citizens, but also visitors and residents of that country, has caused indignation in the media reports. Despite the fact that the scope of data collected in Kuwait's DNA database is difficult to relate to the subject of the functioning of elimination databases in the context of contamination detection and minimization, the author has decided that Kuwait's approach to the issue of collecting genetic information *sensu largo* is so controversial, that it is worth referring to as an interesting fact related to the discussed issues.

The scientific community seems to be terrified, because of a certain paradox, namely a mass registration of people, regardless of whether they have had any conflict with the law or not. Thereby, the basic principles of the protection of personal data cease to exist, not to mention a violation of human rights and fundamental freedoms. It is likely that in the foreseeable future, the citizens of other countries will refrain from visiting Kuwait, due to the obligatory registration in the database. These controversies relate to one of the decisions of the Government of Kuwait, who passed a law introducing the obligation to donate samples of genetic material to the national DNA database for all 1.3 million citizens and 2.9 million foreigners. This Act attracted the interest of many entities, especially those working to ensure the respect for privacy and human rights or even dealing with the lawyers' ethics. Among them was the Human Rights Committee of the Alkarama Foundation, which analyzed the Act no. 78/2015 (date of entry into force: 2 August 2015).

It was stressed that a dangerous precedent relates primarily to the implementation of the principle of obligatory force. Indeed, the legislature determined that all Kuwait's citizens, residents and even visitors, shall be obliged to provide DNA samples to the database. In this way, the scope of applicable law has been extended even onto people who are not under the jurisdiction of Kuwait or are under such jurisdiction only for a short period of time. The said law provides for a penalty of one year of imprisonment or \$33,000 fine for everyone, who knowingly and without giving any reason withdraw from the donation of their DNA samples, while providing a fake sample of genetic material is punishable by seven years of imprisonment. The Government of Kuwait has taken such restrictive steps after a suicide attack carried out by ISIS Islamists on 26 June 2015, during which 27 people were killed and 227 wounded.

Kuwait is so far the first and only country, which has taken so controversial action. It is worth noting that in the case of the European Union, any attempts towards

creating databases with compulsory registration for the entire community (citizens, residents, tourists, etc.) were declared unlawful by the European Court of Human Rights already in 2008, which ruled that collecting genetic material from people that are not in conflict with the law, cannot be considered a necessity in a democratic society. In turn, Sarah Leah Whitson, Middle East director of Human Rights Watch, said that: "*The terrorism argument is so spurious that even the least suspicious among us might begin to wonder whether there is an ulterior motive for this wholesale collection of DNA*" (Taylor, 2016).

In view of the fact that Kuwait's DNA database does not include the registration for elimination purposes (in the context of detection and prevention of contamination of genetic material), and is substantially an extended version of the national DNA database intended for perpetrator identification and, in a sense, crime prevention, the registration covers broadly understood groups of people, i.e. citizens, residents and visitors. The Kuwaiti authorities have developed different schemes of obtaining samples of genetic material for each of the following groups:

- a) Citizens—the acquisition of samples of genetic material will be carried out through a variety of mobile centers, deployed in accordance with a special plan among companies and government bodies, to be used by citizens in places of their employment. Additional centers will be located near the headquarters of the Ministry of Internal Affairs and in the so-called Citizens' Service Centers, to provide free access also in places where citizens perform daily activities, e.g. shopping or banking;
- b) Residents—the acquisition of samples will occur simultaneously with the issuance or renewal of visas, as part of the medical examination carried out by the Ministry of Health upon issuing permanent residency visas as well as during the process of upgrading information about particular citizens by law enforcement authorities;
- c) Visitors—the acquisition of samples will be carried out in a special center located at the National Airport, where, in cooperation with the Department of Civil Aviation, airlines and ambassadors, the visitors will be informed of their rights and obligations in connection with applicable law regarding the collection of genetic material.

The organizations dealing with protection of human rights and fundamental freedoms contend that the provisions concerning mandatory, wholesale, nationwide registration of DNA samples are incompatible with the law, because they not respect the principles of necessity, proportionality and reasonableness with regard to the right to privacy. This creates unlimited possibilities for Kuwaiti authorities to make use of these samples and shows a complete lack of independent control, and thereby no possibility of challenging the applicable law before an independent

court, e.g. the European Court of Human Rights. It can therefore be concluded that the new law of Kuwait constitutes an unlawful and arbitrary interference in the privacy of individual and their families, regardless of whether they are in any conflict with the law or not.

Overview

Presently, the issue of contamination of genetic material in the course of forensic analyses is both a very serious problem and challenge. With the increasing level of forensic knowledge and dynamic development of new technologies, the establishment of forensic databases serving the purposes of the criminal justice system seems to be a necessity.

In view of the fact that the specificity of the laboratory work is closely related with the protection of genetic material from contamination, in particular of internal origin, it becomes appropriate and reasonable to develop and implement clearly defined rules and procedures for effective detection and prevention of contamination, e.g. following the Dutch model discussed herein. An important issue remains a contamination of genetic material at the scene of the incident, originating from persons directly involved in an on-site examination. An additional problematic

issue is the development or adaptation of the incentives for employees of forensic laboratories and law enforcement officials to voluntarily donate their DNA samples, e.g., as in the case of Canada. The lack of awareness of law enforcement representatives implies certain prejudices and fears among the potential donors. There are even cases when people refuse to donate their DNA samples to elimination DNA database because they express concerns about the possibility of bringing them to responsibility as perpetrators of test material contamination, which according to them, would undoubtedly entail incurring huge costs and violating one of the key procedural principles – the principle of economics. On the other hand, forcing the potential donors to provide their samples, as happens presently in Kuwait, constitutes a flagrant infringement of human rights and fundamental freedoms, and it certainly could not take place in a democratic country.

So where to seek the golden mean?

The considerations on the substance and conditions of functioning of elimination DNA databases in selected countries are presented in the form of a summary table (fig. 5), which takes into account the selected elements (indicators) that the author focused on when conducting own research for the purpose of preparing a qualifying assignment (Ćwik, 2016).

Table 1. Tabular overview of selected results of own research, bibliographic and source queries as well as expert interviews.

Country Indicator	the Netherlands	Austria	Canada	United Kingdom	Kuwait (Tabulated data pertain to national DNA database)
Basis for implementation of elimination DNA database	Act on the Protection of Personal Data and internal laboratory procedures	§70, Clause 4 of the SPG (the Police Act) and internal laboratory procedures	Internal laboratory procedures	Act on the Protection of Personal Data and internal subbases' procedures	The Basic Law (no. 78/2015)
Principle of registration in elimination DNA database	Principle of voluntary donation (written consent for registration required)	Principle of voluntary donation (written consent for registration required)	Principle of voluntary donation	In general, the principle of voluntary donation (written consent for registration required). Exception: newly recruited employees and police officers	Principle of obligatory registration

Country Indicator	the Netherlands	Austria	Canada	United Kingdom	Kuwait (Tabulated data pertain to national DNA database)
Directory of persons/materials subject to registration	Laboratory staff, cleaning-maintenance staff, police officers performing on-site duties, contaminations of unknown origin and originating from negative controls, control samples, visitors (customers)	Laboratory staff, "accidental persons", police officers	Laboratory staff, cleaning-maintenance staff, police officers performing on-site duties (e.g. investigators, forensic technicians)	Laboratory staff, cleaning-maintenance staff, police staff (police officers and civilian personnel), SARC personnel, manufacturers of materials used in the laboratory, medical personnel	All citizens, residents and visitors
Compliance with personal data protection provisions	Activities compliant with the current Dutch Personal Data Protection Act (Article (Section) 23.1a) and the Constitution of the Kingdom of the Netherlands of 28 March 1814.	Not determined	No information on the incompatibility with applicable laws	Activities compliant with the current British Data Protection Act (Part 2, item 1)	Incompatibility with the principles of necessity, proportionality and reasonableness with regard to the right to privacy.
Nature of data stored in a database	Anonymous (name of a person entered in a different module with his/her consent)	Anonymous (names; access granted only to the national DNA database's analytical personnel)	Anonymous (reference number assigned; access granted only to laboratory analytical personnel)	Anonymous (reference number, postal code, institution, laboratory kit used, entity subject to registration)	Not determined
Form of volunteer (sample donor) recruitment	Direct interaction, encouragement	Information campaigns, encouragement meetings	Information campaigns, encouragement meetings	Direct interaction, encouragement (not applicable to newly recruited police officers (police subbase) and personnel of particular subbases)	Statutory obligation entailing criminal sanctions

Sources of figures and table:

Figure 1: author

Figure 2: [12]

Figure 3: [9]

Figure 4: [4]

Table. 1: author

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Translation Rafał Wierchostłowski