Final Report of the Interpol European Working Party on DNA Profiling

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INTRODUCTION

The 25th European Regional Conference of Interpol (Warsaw, 29th - 31st May 1996) endorsed the revised European Business Plan, in which promoting good practice in the use of DNA profiling as an investigative technique was one of the main priorities.

In order to implement this task, the Interpol European Committee decided at its 15th Meeting on 5th November 1996 to set up a group of experts in the field of DNA profiling and its application in criminal investigations.

The INTERPOL European Working Party on DNA Profiling (IEWPDP) was formally set up by INTERPOL General Secretariat. It consisted of experts from Belgium, Czech Republic, Germany, Hungary, Italy, Netherlands, Norway, Slovakia, Spain and United Kingdom. Under the chairmanship of Mr. Wim Sprangers (The Netherlands) the Working Party met four times.

The Terms of Reference for the Interpol European Working Party on DNA Profiling were defined as follow:

"To explore and discuss the use of DNA profiling as an investigative technique and make recommendations concerning the use of DNA in criminal investigations with a view to facilitate a wider use of this technique in Europe."

CONCLUSIONS

The Interpol European Working Party on DNA Profiling was established to provide a forum where European experts in the field of DNA profiling could meet to set up guidelines and recommendations with a view to promote the wider use of a standard DNA profiling technique in Europe.

Based on the experience from the countries already routinely using DNA profiling in their criminal investigations and taking into consideration the work already done in this field by other fora such as the European Network of Forensic Science Institutes (ENFSI), the European DNA Profiling Group (EDNAP), the European Union Working Group on Police Co-operation and others, the Interpol European Working Party on DNA Profiling dealt with the following aspects of DNA profiling:

- technical and scientific requirements (DNA technology);
- principles for DNA sampling and evidence collection;
- DNA database;
- categories of offenders;
- quality control and accreditation;
- legal aspects;
- promotion and marketing.

The Interpol European Working Party on DNA Profiling presents its final report. Following its instructions, the Working Party set up the guidelines and recommendations with a view to promote the wider use of a standard DNA profiling technique in Europe as a powerful tool in criminal investigation.

The Working Party based part of its research on the United Kingdom's and the Netherlands' experience in this field. Also other countries represented in the Working Party made a considerable contribution to the conclusions presented in this final report.

The INTERPOL European Working Party on DNA Profiling prepared the main recommendations summarised as follows:

1) The member countries are recommended to use the powerful DNA profiling technique as a tool for criminal investigations and to establish their own national DNA databases respecting the guidelines given by the Interpol European Working Party on DNA Profiling in this report, as well as the European Standard Set of loci recommended by the ENFSI DNA Working Group;
2) DNA databases of offenders and crime scene stains should be as comprehensive as possible in order to ensure maximum efficiency in terms of investigative requirements;
3) The common European standards for sampling, evidence collection and storage (as suggested by the ENFSI Working Group on Scene of Crime) must be respected;
4) Countries are recommended to reconsider their scene of crime work strategy in the light of experience which demonstrates what material can now provide a DNA profile;
5) All institutions involved in the chain of evidence regarding DNA profiling (Police, Forensic Laboratory, Prosecution) are advised to implement a quality assurance system that is accredited by a National Accreditation Body;
6) Countries are recommended to organise training, competence assessment and certification of those people involved in work with DNA evidence;
7) Countries are encouraged to exchange the DNA profiles via Interpol channels to assure the widest possible international co-operation in criminal investigations with respect to their national legislation;
8) Countries should develop an effective and dynamic national marketing strategy to ensure the creation and continuing success of their national DNA database.
9) Further development in this dynamically changing field should continue to be periodically monitored by an expert group, formed by the Interpol European Regional Conference. This group should be composed of both scientists and law enforcement representatives and should provide an update for the European Regional Conference every two years;
10) An international DNA users group conference should be organised by the expert monitoring group under the umbrella of Interpol. The conference should be held approximately one year after the release of this report;
11) The work done by the Interpol European Working Party on DNA Profiling should be brought to the attention of all member countries by presenting it to the General Assembly session. Other regions should be encouraged by a General Assembly resolution to join the process of standardisation of DNA profiling;
12) This Final report should be brought to the attention of the widest possible range of scientific and law enforcement institutions playing any role in DNA profiling, as well as to those who might benefit from its success.

The following text is focused on topics dealing with chapters DNA Profile, DNA Database, Requirements for International Exchange of DNA Profiles and the Future of the Report.

DNA PROFILE

Introduction

A DNA profile is a computerised alpha-numeric value obtained from the visualised output of the DNA analytical process. An example of such a DNA profiling result obtained with the standard set of ENFSI DNA markers is shown in Fig.1 (source: Gerechtelijk Laboratorium Rijswijk, Netherlands).

This profile is inserted to the database and is ready to be searched or exchanged in the following format:

Locus	HUMTH01	HUMvWA	D21S11	Fibrinogen (FGA)
Genotypes	9/9.3	16/19	61/63	22/25

The choice of the set of loci used in the DNA technology has a crucial influence on the profile obtained. Therefore, to facilitate international exchange of DNA profiles, the same basic set of loci needs to be used throughout Europe.

The European Standard Set of loci

The advice of the ENFSI DNA Working Group to define a European Standard Set (ESS) of loci was

accepted by the Interpol European Working Party on DNA Profiling. The ESS now consists of four STR loci:

- vWAFA31/A
- TH01(TC11)
- D 21 S11
- Fibrinogen (FGA)

The power of discrimination of this ESS in the Caucasian population is 0.9999864. This means that the chance that 2 unrelated individuals appearing to share the same profile is approximately 1 in 70 thousand, which is enough for screening purposes. For identification, more loci are needed to increase the discrimination power. To achieve a much higher discrimination power, the ENFSI DNA working group has to extend its standard set of loci. This expanded ESS is expected by July 1998.

The US basic set of loci

In the United States, a process to standardise loci is also taking place. A basic set of loci containing 13 loci, in which the four loci of the ESS are included, is recommended. Expansion of this basic set with 3 other loci is planned. As long as US crime laboratories include the 4 loci of the ESS, the exchange of DNA profiles between Europe and the United States will be possible.

DNA DATABASE

General Conditions

The success of a DNA database for Europe will be dependent on how national databases are organised in the member countries. There are a number of very different factors that will influence national decisions on the creation of that country's database, for example:

- Acceptance of DNA profiling within that society for the purpose of law enforcement;
- Demands defined by the law enforcement agencies;
- Use of DNA profiles in the courtroom;
- Capacity of the laboratories involved to provide forensic DNA profiles;
- Legislation to obtain and retain samples from offenders.

In general terms, a DNA database is a collection of alphanumerical DNA profiles, stored on a computer, to provide intelligence for the investigation of crime. Usually, the database can consist of three parts:

I. Profiles obtained by forensic casework from material left at the scenes of crime of unknown offenders (so called scene profiles),
II. Profiles of convicted offenders, and
III. Profiles of missing persons or relatives of missing persons.

Whenever a new profile (from whatever category) is loaded onto the database, it should be searched against part I and part II of the existing collection to determine if it 'matches' any other profile. This will provide the opportunity to 'match' profiles in the following ways:

Scene to Scene (indicating that the profiles have been left by the same offender at different scenes, thereby linking scenes together for improved intelligence analysis);

Person to Person (indicating that the profiles have been supplied by the same offender. For example, if one offender has provided two or more different identities (not confirmed by fingerprints);

Person to Scene (indicating that the offender left the scene stain from which the scene profile was obtained)

The database, and its supporting legislation, should also have the facility to compare profiles from suspects, who have provided samples to establish their guilt or innocence, against undetected scene stain profiles for which they are suspected.

Databases of missing persons

In order to pursue an active policy in the tracing and identification of missing persons, the establishment of a DNA database for this category of cases is encouraged. Distinct from other relevant information, these databases should (if possible) contain the DNA profile of the missing persons. These profiles might, for example, be obtained from cigarette ends or hair in the comb from the missing person. Also, the DNA profiles from the biological parents and/or the children of the missing person should be included in the database. The profile of future unidentified bodies should be checked against this database.

Apart from the limitations of any national legislation, the capacity of a national database will be limited initially by two principal factors:

- The ability of forensic laboratories to provide profiles quickly enough to match demand. Further investments in additional staff and equipment may be justified when demand has been established and output maximised.
- Any limits on the number or type of profiles to be included. Once the database has been established, these may be increased to match the capacity of the profiling laboratories.

Both of these factors may also be dependent on general acceptance of the database and any political constraints.

Any decisions on the criteria for a national database will have to be made independently by member countries, but the first principle should be that there should be only one database in each country. Many laboratories may have the capability to provide forensic DNA typing and they may be of different types (governmental, university, private labs, etc.). However, any provider of profiles for inclusion on the national database must conform to agreed-upon standards which are applicable to all suppliers.

In Europe, the Working Group on DNA Profiling (EDNAP) has already achieved a high standard between western European countries. The ENFSI Working Group on DNA has agreed on the European Standard Set (ESS) of loci necessary for the international exchange of DNA profiles.

Requirements of a National DNA Database

Main objectives

There should be a single national database of DNA profiles to match those from offenders with crime scene stains.

The database must be constructed in such a manner that it supports the work of law enforcement agencies to detect crime. The database will make it possible to utilise DNA profiling techniques that have created profiles from crime scenes and victims, for comparison against profiles from offenders and suspects.

The database must be able to support forensic casework in other European countries by providing a facility for the international exchange and comparison of DNA profiles.

Computer Systems

The computer system, which is selected, must be able to handle the specific programmes, which are recommended for use today, both from a technical and a functional point of view.

The system must be flexible, allowing room for expansion with a view to multi-tasking in the future. The system must at all times have the opportunity to meet the ESS recommended by the ENFSI DNA Working Group.

Quality Assurance for DNA Database

All laboratories that can provide profiles for the database must be accredited for such work before the database can accept their profiles for inclusion. Quality assurance (QA) systems must have built-in functions which support control and quality management for the registration of profiles, personal details and case related information. The system must also ensure that this information is linked to the correct person/case.

The quality system must also be able to support searches for both direct comparisons, and for intelligence purposes e.g. person-person, person-scene and scene-scene.

Any searches must be carried out with such precision as is required for experts to determine the extent to which two or more profiles resemble each other. The database should provide the statistical importance for each match using legitimate statistical calculations.

Statistics

The computer system must be able to generate statistical reports appropriate for the needs of all agencies who use the database. This will support the system's development and allow for effective monitoring. It should also be possible to generate statistical reports, in the form of management information, concerning the numbers of profiles maintained on the database and their respective categories.

The system should be able to generate statistics which provide information about the effectiveness and efficiency of DNA profiling in relation to the type of offences detected.

Security

The system must have the necessary safety mechanisms to ensure against the loss of data and against unauthorised access (manipulation, amendments, deletions etc.). Access must be strictly restricted to those persons/institutions agreed by the Client - Supplier Agreement. The detailed requirements of such an agreement are given in Recommendations for the Establishment of a National DNA Database (later in text). There must be a log function linked to the register which logs all activity on the database, and which can be used to trace back to the locations and user-ids which have been used.

Exchange of data

The system must support all of the requirements for the export/import of profiles which are the result of international conventions for co-operation in police matters, which the country has ratified.

Reports

Reports must be the standardised form set out in the client-supplier Agreement.

Level of performance and response time

The database must have a level of performance and a response time which satisfies the need of the customer. In this context, it will be helpful to agree on the number of profiles that the system can accept and the rate for their submission.

User access/roles

The system must be able to support several levels of 'user', where each user is only given access, which is appropriate to their role. The roles and access rights should support security in relation to critical functions such as system maintenance, approval procedures, routines for deletion, etc.

Recommendations for the Establishment of a National DNA Database

Client - supplier agreement

Before a national DNA database is created, a client - supplier relationship should be established between the custodian of the database and those who provide and use its services. This relationship should be based on a formal agreement, which regulates co-operation between the police, as the principal customer, the laboratory(s) as providers of the profiles, and the custodian as the supplier of the database services. The 'custodian' of the database may be the forensic laboratory service for that country, or some other independent agency.

The form and content of the agreement will vary, based on the country's current situation in terms of legislation, and the organisation of the police and laboratories. In cases where laboratories are not linked to the police organisation, the agreement should take the form of a formal understanding or contract.

The most important function of the agreement is to ensure standardisation of the flow of information and tasks, and to ensure the necessary degree of quality in every aspect of DNA work. It is crucial that all tasks, products, roles, and responsibilities be defined clearly, and agreed for the entire production process.

A key element of the Agreement should be the expectations concerning delivery times; from the sample being delivered to the laboratory for analysis to a profile being produced for inclusion on the database. The delivery time to the database should be included in the Agreement in countries where more laboratories are involved. A 'standard' service should be sufficient for most samples, whilst an 'express' service should be available (possibly at extra cost) for urgent cases.

Agreement should also be reached on the format and content of scientist's reports and the mechanisms for delivery. It is preferable that such results and reports be delivered both on paper and by electronic transfer.

The agreement must specify levels of access: who may enter information and results into the database; who, and under what circumstances, is authorised to operate and maintain the database; and who is to have access to carry out searches, and collect results.

The agreement must ensure that information from the database conforms with judicial practice in that country.

The agreement must describe the quality assurance requirements for every step of the chain of production, from the taking of a sample to the final result of the analysis being stored in the database.

DNA Analysis

The DNA technology and profile formats should meet the international standards and recommendations made in this Report.

REQUIREMENTS FOR INTERNATIONAL EXCHANGE OF DNA PROFILES

Introduction

International exchange of DNA profiles within Europe can be based on two different options:

I. Creating one centralised European DNA database in which the participating countries can search specific DNA profiles.
II. Based on national DNA databases where specific DNA profiles from one country can be searched against the DNA database of another country. Existing Interpol rules would be the basis for this option.

A centralised European DNA database is not recommended by the Working Party. As many European countries still need to create their own National databases, to improve the law enforcement in their respective countries, the added value of a European DNA database would be very limited.

Based on discussions about the perceived efficiency, effectiveness, completeness and total response time the second option is preferred.

Interpol can facilitate the fast exchange of DNA profiles together with the necessary administrative information, among European countries. At a later stage expansion to facilitate world wide exchange of DNA profiles for searches in a national database can be foreseen.

DNA Profile of Unknown Offender

A document for the transmission of unidentified DNA profiles between Interpol European member countries has been prepared. This form is based on the design of the forms used for transmitting fingerprints and unidentified finger marks via Interpol. The Working Party also decided not to create a paper document but instead to create an electronic form for the purpose of sending this information. This should be available at the beginning of 1999.

DNA Profile of a Known Offender

As this working party decided not to create any paper documents for the transmission of DNA information, it was decided to include the profile of a known offender in the Interpol formatted messages. Interpol has already created a formatted message for the transmission of information relating to known offenders and the DNA profile will now be included in this section.

THE FUTURE

In the near future several developments regarding DNA profiling may be expected:

a) The European Standard Set will expand with more loci in the coming years;

b) The development of techniques for profiling of mitochondrial DNA (mtDNA) which will enable the determination of DNA profiles from materials as hairs, teeth and bones. Although the fundamental developments of the mtDNA analysis are concluded some additional investigations are needed before this technique can be utilised. A kit for mtDNA is under development at the Forensic Science Service (UK) and there is a requirement for a screening test for hairs and an evaluation of the usefulness of the different types of trace evidence. To justify a creation of mtDNA database, more insight has to be obtained about the population genetics of mtDNA;

c) The development of capillary electrophoresis as a separation and detection method for the loci.

d) The development of the DNA-chip technology as a profiling method to replace traditional laboratory techniques;

e) Sensitive PCR techniques might allow successful analytical results from the genome of one single cell.

The full introduction of the techniques mentioned under **a**, **b**, and **c** in forensic laboratories will be realised within the next 5 years. The development of the technique mentioned under **d** and **e** can be fully implemented in forensic science laboratories within 5 to 10 years.

The development of the above mentioned techniques will result in similar information as obtained by the techniques described in chapter 3 of this report (not published). As a result, comparisons of new data with historic data will remain possible when using the techniques under development.

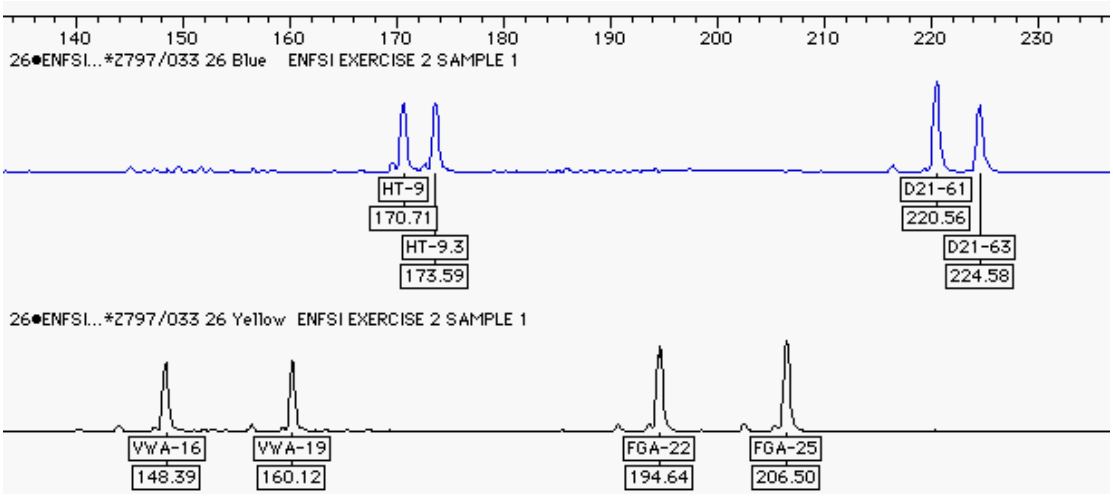

Figure 1

This profile is inserted to the database and is ready to be searched or exchanged in the following format:

Locus	HUMTH01	HUMvWA	D21S11	Fibrinogen (FGA)
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