

DNA Development and its Importance

MSc. Artur Gaxhi (PhD Candidate)
Judge, Judicial District Court of Tirana, Albania
Faculty of Law, University of Tirana, Albania

Abstract

As we all are aware now the discovery of DNA is the most significant biological discovery of the 20th century. This discovery has had a tremendous impact on science and medicine.

In the field of modern medicine and genetic research, the discovery of DNA has allowed for the improved ability to diagnosis disease, detect genetic predisposition to disease, create new drugs to treat disease, use gene therapy as treatment, and design “custom drugs” based on individual genetic profiles.

In criminal investigations, DNA has proven to be a powerful tool. Since no two people, excluding identical twins, can have similar DNA, the identification of a offender person through DNA analyzes is more than indubitable.

DNA can be used successfully on victims identifying process. Identifying the victims of the September 11, 2001, World Trade Center attack presented a unique forensic challenge because the number and identity of the victims were unknown and many victims were represented only by bone and tissue fragments.

Today with the creation of a common space as the European Union, new opportunities and requirements needs among states to make possible the collaboration as valid and effective against crime or terrorism is more necessary. For this reason arises the idea of exchange of genetic information between them for Law Enforcement Operations which is supported on the AIA’s agreement for a greater security among states space.

Keywords: DNA¹, RFL P², PCR³, Prum’s Treaty⁴

¹ Deoxyribonucleic Acid- is a nucleic acid that contains the genetic instructions used in the development and functioning of all known living organisms.

² Restriction Fragment Length Polymorphism (RFLP)- is a technique for analyzing the variable lengths of DNA fragments that result from digesting a DNA sample with a special kind of enzyme.

³ Analysis- Polymerase chain reaction-is used to make millions of exact copies of DNA from a biological sample. DNA amplification with PCR allows DNA analysis on biological samples as small as a few skin cells.

⁴ Known as Schengen III Agreement - signed on 27 May 2005 by Belgium, Germany, Spain, France, Luxembourg, The Netherlands and Austria, which allowed the police forces of their countries to compare and exchange data more easily.

DNA Development and its Importance

DNA (deoxyribonucleic acid) is a genetic molecule that consists of two spiral wrapping chain. DNA is the substance in the cell nucleus and its integral part is the chromosome that determines the genetic code of each person's individual characteristics. Found in every cell of the human body as the brain, bones, blood, hair, DNA is unchangeable during all human life.

Each one people contain the genetic code called a composed gene and consist of 48 chromosomes composed of DNA⁵. No individual has similar DNA to another one (except twins) and this makes DNA evidence as more credible evidence for those offenders convicted of a crime or to prove their innocence.

Effective use of DNA as evidence requires the collection and analysis of a sample from the crime scheme, protection from air and to secure better package and seal. In this way and very well maintained, DNA can also be undamaged through years.

Regarding methods used for the DNA expert analysis we can notice that there are two methods:

- RFLP method, which is based on determining the length of the unencrypted parts of the DNA chain (old method);
- PCR method, the polymerase chain reaction. This method makes the multiplication of DNA sequences with hyper variable regions. This method has resulted with much more priority and more valuable in comparison with RFLP method, because PCR method can used a very small amount of biological material for its expertise and analysis. It can exploit the characteristics of DNA molecules and to reproduce them in many copies necessary to identify a person.

Also this method progressed through enabling the identification based on biological material from dead bodies changed as decay or disintegration which was not possible with RFLP method. Thanks to this method the results can be obtained within a few hours (while the RFLP methods require a period of 3-4 weeks) and makes possible the analysis of biological compounds to some people, making their separation and classification.

Discoveries made in the last twenty years of molecular biology have had a fair impact on the criminal process. Continuous improvement of the technology through the molecular biology laboratories, enabling already taking genetic samples even in not good decomposition conditions and a computer system that is able to maintain a high number of genetic profiles, has spread a new form of crime investigation through the DNA data.

⁵ C.FANUELE, *Dati genetici e procedimento penale*, Padova, 2009, fq.94.

The first Police Office in the world who used genetics to identify the guilty persons participating on a crime was Scotland Yard in 1986 that realized to solve the issue of identifies the killers of two minor girls in the Midlands through experimenting successfully with this scientific instrument in court rooms⁶.

The first investigation of forensic genetics science comes from the discovery made by University of Leincester from the Englishman Alec. J. Jeffreys, who in 1985 identifies the full human genome, starting thus a usage of DNA profiling for personal⁷ identification in criminal matters.

The procedure for DNA testing consists of three phases:

- recruitment;
- extraction of the genetic profile;
- comparison of results

It comes to extracting DNA from collected biological traces by comparing the DNA with that of the suspect and checked if they are the same.

During the recent years it was rapidly increased the role of biology in the identification investigate, particularly the use of DNA and archived data with genetic profiles of individuals, making thus possible the capture of the persons who have committed a crime but also the identification of bodies that were still unknown.

Use of DNA in different areas not only aroused interest in academic and political scientific environments but also public interest that requires more and more a high technological study. We often read or see various articles where it is written that the perpetrator was caught by infallible DNA evidence even though they may have spent many years from the time of the crime. Thanks to the discovery of DNA in today's more crimes or court cases left in silence for lack of evidence today find a solution and lead them to justice those responsible people. It should be noted that frequent use of genetic investigation is done thanks to the laboratory techniques to extract the evidence if it biological, blood, saliva, hair, bones, etc.

Results of DNA Analysis

Three results could go during DNA testing phases:

- **involvement**, occurs when the DNA profile of the victim or a suspect people complies with DNA Profile found at the crime scene, in this case the suspected people will be included as a possible source of that evidence;

⁶ FANUELE, *L'indagine genetica nell'esperienza italiano ed in quella inglese in Riv. it. Dir. Proc. Pen.* 2006, 732

⁷ JEFFREYS – WILSON – THEIN, Individual – Specific "Fingerprints" of Human DNA, in *Nature*, 1985, 76

- **exclusion**, occurs when the DNA profile of the victim or a suspect people does not comply with DNA Profile found at the crime scene, this thing can help a person's innocence (but in this case it must be taken into account a extremely careful person who is care not to leave evidence);
- **unclear**, DNA testing in this case can include or exclude the person as a biological source. Reasons why this happens are many such as insufficient amount of DNA or the presence of many different DNA at the same location. In this case, further testing should be done.

Places where DNA can be found are numerous bite marks, hair, nails, saliva, blankets, sheet, pillow, glass vessels, etc.

Database Technology

From the assessments made, improvement and further development of this technology of DNA profiling, the last fifteen years Europe has introduced in its legislation the database technology (this method, used in many U.S. and United Kingdom, as well as for identifying profiles also for archiving). These instruments bring such advantages in the investigation of events, bringing in the first place a precisely crime description, a quick investigation and secondly, their use saves more research and economic costs.

Angles statistics⁸ shows that it was proved that the exact use of DNA database has brought a large solve out of cases for identifying more criminal's people⁹. England is the most advanced country in terms of this method but also most strict and criticized country, for the fact that, even without proven guilt of a person and just depending on several charges, they records the DNA of suspects by making so an ex ante evaluation.

In fact recently it was proposed a request from Scotland Yard's Department of Science, in which it was required the registration of minors DNA less than 10 years of age who facing problems and have antisocial behavior, which may bring the performance of a subsequent crime, this request is unacceptable from the European Union. The European Union has chosen a middle approach to database of people DNA registering only those persons with criminal precedent and perpetrators of a crime and delete those of them found innocent, thing that England does not realized.

Primary objective of this technology in addition to the fact of the identification of persons is also giving assistance to criminal investigations for crimes of people relapse, especially sexual ones. So by being archived genetic profiles of people it helps in case of a repetition by the person in identifying and resolving the criminal case.

⁸ *Expansion program 2000-2005, Reporting Achievement*, in UK Home Office

⁹ Angles Database consist of 3. 400 000 identification archived profiles. *Parliamentary Office of Science and technology, Report*, 2006, n. 258, 2006, 1.

Some authors have named and criticized the technology as a form of social control, discriminatory and as a kind of supervise system¹⁰, although in most cases it comes to people who are not identified yet but in case of repetition made the comparison with known samples in order to set up a charge.

In many countries this system requires an evaluation by a legal authority over social Hazard person under investigation, realizing this as a risk that the person may again commit another crime¹¹, Germany has chosen this system, while France is using always after a request of police or judicial authorities only for crimes like murder of minors, sexual violations, and torture.

A Source Book for DNA Forensics.

Legal biologists practitioners for a particular case often face needing to access the information from previously published materials such as newspaper articles, monographs, books and internet. A more useful tool would be a book about DNA in Forensics accessible through the web, providing a form of 'one-stop shopping' for a full compilation of all relevant sources, and a study of published literature. It is created a prototype master document for DNA. Each reference in this master document has a link to summary / publisher / full article, to connect the source and availability of reference. There are collected, categorized and hyper-linked to more than 11.000 references and their summaries.

Optimization, Testing and sanctioning of new DNA technologies

National Institute of Justice (new technologies selected in the laboratories of criminology by providing assists in the transfer of personal information, assistance for the principal investigator is funding a large number of projects, clarity purpose of which is developing new DNA technologies in order to make DNA tests with the fast, better and cheaper method. This is especially important for those who are not coroners in particularly. Such assistance includes, in consultation with leading investigators, optimization of technologies for forensic analysis, limited specimens in quantity and quality, testing methodology and, if requested, a full-scale sanction for improved technology.

Towards the Creation of a European DNA Room, Prum Treaty

DNA test is a demonstration of technological power of science to be put in the service of criminal law. Only with the stipulated criteria in laws, which define those results of DNA to be analyzed and archived for finding personal identity and how long genetic

¹⁰ WILLIAMS – JOHNSON, *Forensic DNA database : European Perspective, interim report, Durham, 2005, 11*

¹¹ STEFANINI, *Dati genetici e diritti fondamentali. Profili di diritto comparato ed europeo, Padova, 2008, 171*

samples and information can be stored and can make the necessary investigation, one of the most necessary instrument for criminal investigation in respect of the European Convention no. 108 for the protection of personal data.

Many countries are interested in creating data on DNA by the arguments suggested by the European Council. Today with the creation of a common space as the European Union, new opportunities and requirements needs among states to make possible the collaboration as valid and effective against crime or terrorism is more necessary. For this reason arises the idea of exchange of genetic information between them for Law Enforcement Operations which is supported on the AIA's agreement for a greater security among states space.

One of the international law sources is the Prum's Treaty (by the other words Shengen³) on May 27, 2005, in which, seven states in Prum of Germany (France, Belgium, Netherlands, Luxembourg, Austria, Germany, Spain)¹² establish a cooperation and an exchange of personal information including DNA, fingerprints and license plates of cars. So, every country on the basis of this Tractate can enter data directly in another country and taking all necessary information.

States should consider the results of studies conducted by international organizations such as Interpol. One of the latest initiatives of Interpol is the conviction of Interpol member states for keeping DNA data archived, taking as example the CODIS model in the U.S. This last method was experimented in the laboratory in 1990 and now it is a very successful method as it is not simply a database that holds the genetic profiles but also a procedure record that analyzes and controls laboratories where DNA analyzed.

Regarding with the flow of data from one state to another, the identity of a person against whom there is an investigation through DNA, may be required that state which has in its database, only if there is a connection between the positive result that a person may have with the evidence found in a crime scene. We can think here the assistance which may be provided between the states for locating missing persons or the identification of human waste and corpses.

All countries should adhere to European standards for sampling for comparison, evidence collection and preservation of their material. All institutions that are linked to procedures that are followed to search the expertise to biological materials found at the scene in order to obtain DNA profiles, should implement a system of safety and quality control, accredited by a national accreditation body.

All countries need to exchange DNA profiles through Interpol, to ensure the broadest international cooperation possible, in accordance with relevant national legislation. Even in Albania, we have no one legislation to cover and to regulate this area and

¹² www.europa.eu.int/eur-lex/fr/lif/dat/1997/fr

this means so important to the fight against crime investigation and who suffers from so many Albanian society. The existing Criminal Procedure Code is quite incomplete in this area and the existing provisions are of a more general character. For this it is needed to necessarily work as soon as possible with the drafting and adoption of specific laws by the relevant qualified experts in this field.

Bibliography

1. A. RAMIJAK, medical Criminology, Prishtina, 2007;
2. A. Fiori, La evidence in legal medicine, in Riv. it. med. leg., 2004, p. 3.
3. C. FANUELE, Dati genetici of criminal procedimento, Padova, 2009;
4. C. FANUELE, L 'italiana indagine ed in genetic nell'esperienza Quelle Ingles in Riv. it. Dir. Proc. Pen. 2006, 732,
5. D. L. DE CATALDO NEUBURGER, La Scientific evidence nel processo penal, Padova, CEDAM, 2007
6. D. P. FELICONI, sulla people the processo Accertamenti criminal prelievo il biologico di materials, Milan, IPSO, 2007
7. E. APOLINAR AND W. Rowe: Examination of Human fingernail ridges by Means of polarized light, Jornal of forensic science, 25, 1980;
8. G. UBERTIS, La criminal evidence, Turin, 1995,
9. GANDINI, Il Trattato di articolo per articolo Prum Ecco la le NUOVE Frontier for SICUREZZA. Banca dati antiterrorismo of congiunti in sette stati interventi dell'UE, in Dir. giust., 2006, n. 37, 60
10. Jeffreys - WILSON - thei, Individual - Specific "Fingerprints" of Human DNA, in Nature, 1985, 76
11. L. G. VERSTA, Voiceprint Identification, Nature, New York, 1962
12. P. TONINI, la criminal evidence, Padova, 2000
13. O. TOSI, Voice Identification. Legal Teory and applications, University Park
14. Press, Baltimore, 1979.
15. WILLIAMS - JONSON, genetic Policing, the Use of DNA in Criminal
16. Investigations, London, 2008.
17. WILLIAMS - Johnson, a forensic DNA databasing: European Perspective, interim report, Durham, 2005, 11
18. Stefanini, Dati genetici of fondamentali diritti. Profile comparato ed Europeo di diritto, Padova, 2008, 171;
19. S. Beget, Criminology, Sh.B. Erik, Tirana 2001

Web Site of Consulted

1. <http://euro-lex.europa.eu/lex>
2. [www.interpol.int / public / forensic / fingerprints / working](http://www.interpol.int/public/forensic/fingerprints/working)
3. www.garanteprivacy.it