Maja Pilić, Assistant Professor[1]

CONTENT OF THE RIGHT TO PROTECTION OF PRIVATE AND FAMILY HOME AND THE RIGHT TO PROTECTION OF PERSONAL DATA WHEN USING DNA ANALYSIS AS EVIDENCE IN CRIMINAL PROCEEDINGS

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Abstract

Molecular genetic analysis is a very reliable and effective means of evidence because it enables the identification of perpetrators of criminal acts, victims and close relatives. DNA analysis consists of a series of related procedures such as DNA extraction and analysis, storage of data obtained through DNA analysis and future use of the obtained data. It is a type of expert examination whose primary purpose is to detect, prove and prevent criminal acts, but whose violation may lead to restrictions or violations of fundamental human rights and freedoms of individuals, but ultimately to the release of wrongly convicted persons. Identification of a person based on DNA expert examination is considered the most effective technique for identifying a person, i.e. suspects, based on biological material left at the scene of a criminal act and is indispensable in solving and proving a large number of criminal acts. Forensic DNA technology is used to analyze DNA profiles that usually originate from human DNA samples. These samples can be collected from crime scenes or from the bodies of suspects or victims, and the DNA profiles are then compared with previously stored profiles in a DNA database to identify matches. However, DNA analysis data are genetic data which, under Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of individuals with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC, fall into the category of personal data concerning a person's health and as such are prohibited from being processed except in the cases provided for in the Regulation.

[1] Assistant Professor, University Department of Forensic Sciences, University of Split, Faculty of Law, University of Mostar, contact: maja.pilic@forenzika.unist.hr.

Furthermore, the collection of data from DNA samples without the consent of the suspect or another person infringes the right to physical integrity, and the retention and storage of such data infringes the right to respect for private and family home under Article 8 of the (European) Convention for the Protection of Human Rights and Fundamental Freedoms. On the other hand, given the increasing prevalence of artificial intelligence in all social spheres, including in the field of criminal law and justice, its ability to use data and algorithms may pose a certain risk to the genetic information contained in DNA samples. Unauthorized access or misuse of DNA samples may threaten the right to privacy of an individual, which is why it is necessary to establish normative and security measures to ensure that such genetic data are used only for specific purposes and are stored securely. In this paper, the author seeks to determine the limits of permissibility and the content of the rights covered by the use of DNA analysis as evidence, and in particular the Convention right to the protection of private and family home and the protection of personal data obtained from samples of biological material. The aim is to analyze how to ensure the protection of the forensic use of DNA for the administration of justice and the protection of human rights as two interdependent social interests.

Keywords: molecular genetic analysis, right to the protection of private and family home, genetic data, protection of personal data, artificial intelligence

I. Introduction

Human rights and freedoms, as the highest legal goods, enjoy criminal law protection in all legal systems. In criminal proceedings, regardless of the merits of the case, the question of violation of certain rights and freedoms guaranteed by the (European) Convention for the Protection of Human Rights and Fundamental Freedoms (hereinafter: the Convention)[2] often arises, either as a consequence of the implementation of a certain procedural action or as a matter in itself. The very nature of criminal procedure involves actions that restrict human rights and freedoms, such as arrest, although such restrictions are considered lawful because they serve the protection of the legal order, public peace, and order. Moreover, certain procedural evidentiary

[2] (European) Convention for the Protection of Human Rights and Fundamental Freedoms, IC, No. 18/97, 6/99, 14/02, 13/03, 9/05, 1/06, 2/10, 13/17)

actions prescribed by the Criminal Procedure Act (hereinafter: CPA)[3] also restrict individual human rights, such as the right to respect for private and family life under Article 8(1) of the Convention. Privacy, as a fundamental human right, is recognized in the Universal Declaration of Human Rights[4], the International Covenant on Civil and Political Rights[5], and many other national constitutions by which countries explicitly acknowledge the right to privacy. A key issue related to the potential violation of this right is the use of molecular genetic analysis as evidence in criminal proceedings, as it contains highly sensitive personal information about individuals. This is particularly relevant because the samples collected from the crime scene are stored and kept in a DNA database, which is susceptible to misuse. According to the CPA, molecular genetic analysis is defined as a procedure for analyzing DNA, the basic genetic material of humans and other living beings.[6] Such genetic data, under Regulation (EU) 2016/679 of the European Parliament and Council of 27 April 2016 on the protection of individuals with regard to the processing of personal data and on the free movement of such data (hereinafter: the Regulation)[7], are considered *"personal data relating to the inherited or acquired genetic characteristics of an individual which provide unique information about the physiology or health of that individual and which are obtained in particular from the analysis of a biological sample from the individual in question."*[8] These are data that are highly sensitive and fundamentally different from other types of health data. This is because genetic (predictive) tests reveal information not only about the individual but also about their genetic relatives. The information obtained from genetic tests can predict future health risks for healthy individuals and may also reveal current and future health data about the biological relatives of the tested individual in ways that no other medical information can.[9] Furthermore, innovations and developments in forensic DNA analysis have led to the use of new techniques to

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[3] Criminal Procedure Act, Official Gazette, No. 152/02, 76/09, 80/11, 121/11, 91/12, 143/12, 56/13, 145/13, 152/14, 70/17, 126/19, 126/19, 130/20, 80/22

[4] Art. 12. Decision on the publication of the Universal Declaration of Human Rights, NN, No. 12/09

[5] Article 17 of the International Covenant on Civil and Political Rights

[6] Art. 202. paragraph 32. of the CPA

[7] Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of individuals with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC, OJ L 119, 4.5.2016, pp. 1–88.

[8] Art. 4, paragraph 13 of the Regulation. A similar definition is contained in Directive (EU) 2016/680 of the European Parliament and of the Council of 27 April 2016 on the protection of individuals with regard to the processing of personal data by competent authorities for the purposes of the prevention, investigation, detection or prosecution of criminal offences or the execution of criminal penalties, and on the free movement of such data, and repealing Council Framework Decision 2008/977/JHA, OJ L 119, 4.5.2016, pp. 89–131, paragraph 23.

[9] Singh, K.K., Human Genome and Human Rights: An overview, Journal of the Indian Law Institute Vol. 50, No. 1, 2008, pp. 69.

identify perpetrators of criminal acts using forensic DNA phenotyping. This refers to a set of techniques aimed at determining externally visible human physical characteristics—such as eye, hair, and skin color—and continental biogeographic ancestry of suspects based on the analysis of biological materials collected at crime scenes.[10]

II. Overview of Sources for the Protection of Data from Molecular Genetic Analysis

In discussions about the human genome and human rights, genetic information holds a special place because of its highly sensitive nature. Information obtained from genetic tests can predict future health risks for healthy individuals and can also reveal current and future health data of biological relatives of the tested individuals in ways that no medical information can.[11] Data from DNA analysis are genetic data which, under the Regulation, fall into the category of personal health data and are therefore prohibited from being processed, except in cases prescribed by the Regulation. The Regulation was preceded by the Council of Europe Convention of 28 January 1981 for the Protection of Individuals with regard to Automatic Processing of Personal Data (hereinafter: the 1981 Convention)[12], which was the first legally binding international instrument in the field of data protection. According to it, data related to health belong to a special category of personal data.[13] Furthermore, the 1981 Convention prescribes that personal data subject to automatic processing must be: b) stored for specified and legitimate purposes and not used in a way that is incompatible with those purposes; c) adequate, relevant, and not excessive in relation to the purposes for which they are stored; e) retained in a form which permits identification of data subjects for no longer than is necessary for the purposes for which the data are stored.[14] Although the Convention does not contain a provision specifically on the protection of personal data, according to the case law of the European Court of Human Rights (hereinafter: ECtHR), collecting data from DNA samples without the consent of a suspect or other individual constitutes an

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[10] Machado, H., Silva, S., What influences public views on forensic DNA testing in the criminal field? A scoping review of quantitative evidence, Human Genomics, 2019, 13:23, pp. 2.
[11] Singh, K.K., *op.cit*., pp. 69.
[12] Convention of the Council of Europe of January 28, 1981 for the protection of persons with regard to automated processing of personal data, Strasbourg, 28.I.1981, CETS 108
[13] Art. 6 of the Act on the Ratification of the Convention for the Protection of Individuals with regard to Automatic Processing of Personal Data and the Additional Protocol to the Convention for the Protection of Individuals with regard to Automatic Processing of Personal Data concerning Supervisory Authorities and International Data Exchange, NN, No. 4/2005
[14] Art. 5. 1981 Convention.

interference with the right to bodily integrity, and the retention and storage of such data violates the right to respect for private and family life under Article 8 of the Convention. Regulations protecting personal data collected for the purpose of molecular genetic analysis can be divided into two categories: international legal instruments and domestic legal provisions.[15]

Among the most important documents governing genetic data and information, in addition to those mentioned above, is the Universal Declaration on the Human Genome and Human Rights of 11 November 1997 (hereinafter: the 1997 Declaration).[16] This document defines the human genome as the basis of the fundamental unity of all members of the human family, as well as the recognition of their inherent dignity and diversity. Symbolically, the genome represents the heritage of humanity.[17] On the other hand, the International Declaration on Human Genetic Data from 2003 (hereinafter: the 2003 Declaration)[18] defines human genetic data as data on the hereditary characteristics of individuals obtained through the analysis of nucleic acids or other scientific analyses.[19] It also stipulates that such data must be destroyed when they are no longer needed, except where otherwise provided by domestic law in accordance with international human rights law.[20] Another important document is the Universal Declaration on Bioethics and Human Rights of 19 October 2005 (hereinafter: the 2005 Declaration)[21], which aims to promote respect for human dignity and the protection of human rights.[22] It emphasizes the need to respect individuals' privacy and the confidentiality of their personal information. Such information should, to the greatest extent possible, not be used or disclosed for purposes other than those for which it was collected or for which consent has been obtained, in accordance with international law, and particularly international human rights law.[23]

One specific purpose for which genetic information is used is DNA analysis as evidence in criminal proceedings. Biological samples collected from crime scenes or other locations

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[15] Also according to: Veić, P., Normativna uređenost pohrane, obrade i čuvanja podataka molekularno-genetske analize u Republici Hrvatskoj, Polic. sigur. (Zagreb), godina 21. (2012), broj 4, pp. 777.
[16] Universal Declaration on the Human Genome and Human Rights, 11 November 1997
[17] Art. 1 of the 1997 General Declaration.
[18] International Declaration on Human Genetic Data, 16 October 2003
[19] Art. 2. item i) of the 2003 International Declaration.
[20] Art. 21, item b) of the 2003 International Declaration.
[21] General Declaration on Bioethics and Human Rights of October 19, 2005
[22] Art. 2. item c) of the 2005 General Declaration.
[23] Art. 9 of the 2005 General Declaration.

containing traces of a criminal act are compared with samples taken from the accused, the victim, or another individual—either to establish identity or to match traces or samples with results of molecular genetic testing conducted in accordance with the law.[24] To allow for the use of molecular genetic analysis in criminal proceedings at the level of the Council of Europe, Recommendation No. R(92)1 on the Use of Analysis of Deoxyribonucleic Acid (DNA) within the Framework of the Criminal Justice System, adopted on 10 February 1992 (hereinafter: the Recommendation)[25], was issued. The Recommendation provides that member states should strive for standardization of DNA analysis at both national and international levels through mutual cooperation, and that international exchange of DNA analysis results should be conducted only between states that accept and implement the conditions outlined in the Recommendation.[26]

As for domestic legal provisions, the protection of data from molecular genetic analysis primarily derives from the CPA, which forms the basis for collecting biological samples from crime scenes or other relevant locations. In addition, the CPA prescribes retention periods depending on whether the person is convicted, the proceedings are dismissed, or the person is acquitted. The method of collecting samples is regulated by the Ordinance on the Manner of Taking Biological Material Samples and Conducting Molecular Genetic Analysis.[27]

III. Limits of Admissibility for the Use of Data from Molecular Genetic Analysis

Genetics, as a science, provides very reliable sources of truth, especially in disputes concerning human identity. Some authors even claim that genetics as a science produces truthful facts about human identity and that determining the truth in matters of identity is equivalent to ensuring justice.[28] This reliability of data is particularly important for detecting and prosecuting

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[24] Art. 327. para. 1. CPA

[25] Recommendation No. R(92)1 on the use of analysis of deoxyribonucleic acid (DNA) within the framework of the criminal justice system (adopted on 10 February 1992), available on: https://rm.coe.int/09000016804e54f7

[26] Pilić, M., Aktualno uređenje i primjena DNK analize u kaznenom postupku u Bosni i Hercegovini: mogućnost primjene rješenja Europskog suda za ljudska prava, Radovi s Pete međunarodne naučne konferencije "Pravni i ekonomski aspekti procesa integracije Bosne i Hercegovine u Evropsku uniju", Revija za pravo i ekonomiju, Godina 24., broj 2., Mostar, 2023, pp. 267.

[27] Pravilnik o načinu uzimanja uzoraka biološkog materijala i provođenja molekularno-genetske analize, NN br. 120/2014

[28] *Ibid*, note 1.

perpetrators of criminal acts, and it can be said that molecular genetic analysis is a highly effective evidentiary procedure in criminal proceedings because it enables the identification of a potential perpetrator, victim, or other relevant person.[29] However, due to their specific nature, data obtained from molecular genetic analysis are susceptible to various forms of misuse and therefore require a high level of protection. Molecular genetic analysis consists of a series of connected procedures, including the collection, processing, storage, and retention of data obtained from biological samples found at the scene of a criminal act. Each of these procedures raises certain ethical questions. From a criminal law perspective, an especially important issue is the retention of data from biological samples depending on the outcome of the criminal proceedings. This was addressed in the precedent-setting case of S. and M. Marper v. the United Kingdom before the European Court of Human Rights (ECtHR).[30] In that case, the ECtHR found a violation of the right to respect for private and family life under Article 8 of the Convention regarding the retention of DNA samples after acquittal or termination of criminal proceedings against the applicants. S., after being acquitted, and M. Marper, whose proceedings were formally discontinued, argued that the retention of their DNA samples and profiles interfered with their right to respect for private life, as such sensitive information was linked to their personal identity. They also claimed there were insufficient procedural safeguards to protect against the misuse or abuse of the data. This was particularly concerning because the records in the National Police Computer System were not only accessible to the police but also to bodies cooperating with the police. They emphasized that retaining such records stigmatizes acquitted individuals by implying that they are not entirely innocent. Their claim was rejected by the Administrative Court and subsequently by the House of Lords. Lord Steyn concluded that the mere retention of fingerprints and DNA samples does not interfere with private life and that it is proportionate to the aim pursued, citing five supporting factors: 1) Fingerprints and DNA samples were retained only for the limited purpose of detection, investigation, and prosecution of crime; 2) Fingerprints and DNA samples are useless without a corresponding match from a crime scene; 3) Fingerprints are not publicly accessible; 4) The untrained eye cannot identify a person based on the sample; 5) Expanding the database provides significant advantages in the fight against serious crime. What is specific in this case are the

[29] Data from molecular genetic analysis began to be used in 1985. Pavišić, B., Modly, D., Veić, P., Kriminalistika, Knjiga I, Golden-marketing-Tehnička knjiga, Zagreb, 2006, pp. 567.
[30] Case S. and M. Marper v. the United Kingdom, No. 30562/04 of 4 December 2008.

provisions of UK domestic law, which makes the issue of privacy protection particularly relevant. The ECtHR held that although fingerprints reveal less personal information than DNA samples, the general and indiscriminate power to retain fingerprints, cell samples, and DNA profiles of individuals suspected but not convicted of crimes does not strike a fair balance between competing public and private interests and constitutes a violation of the right to respect for private and family life.[31]

One of the most important issues concerning the effective use of DNA samples in criminal proceedings is the existence of an efficient DNA database. Many factors influence the creation of such a database, but most importantly, the legislation and its restrictions on the use of these databases.[32] Even if laboratory quality is excellent and processing times are short, inadequate legislation can severely limit the potential of DNA databases.[33] The primary function of a forensic DNA database is to generate matches between individual profiles and samples found at crime scenes, which requires constant input of both types of data. Approximately 69 countries currently have a national DNA database, while others are expanding or establishing them in at least 34 countries. In society, there is ongoing debate about the use of DNA samples in the criminal justice system. One group of authors sees it as a valuable tool for enhancing efficiency in fighting crime, aiding in prevention, and deterring criminal activity. On the other hand, there are potential threats to civil liberties—especially regarding the storage of profiles in computer databases functioning as forensic DNA repositories—which may endanger a wide range of human rights, particularly freedom, autonomy, privacy, informed consent[34], moral and physical integrity, and the presumption of innocence. Other risks noted in the literature regarding forensic DNA testing include: social stigmatization and racial stereotyping due to the overrepresentation of specific social and ethnic groups in DNA databases; concerns that data processing may link individuals or groups to specific characteristics or criminal behavior, potentially leading to discrimination;

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[31] Pilić, M., *op.cit.,* pp. 279-280.
[32] See an overview of DNA databases in 22 European countries: Santos, F., Machado, H., Silva, S., Forensic DNA databases in European countries, is size linked to performance?, Life Sciences, Society and Policy 2013, 9:12, pp. 1-13.
[33] Asplen, C., Međunarodna praksa glede DNA-baza podataka, pp. 210. in: Primorac, D. et.al, Analiza DNA u sudskoj medicini i pravosuđu, Medicinska naklada, Zagreb, 2008., pp. 210.
[34] With fully informed consent obtained, the collection and storage of DNA data is no longer unethical. Parven, K., Forensic Use of DNA Information v Human Rights and Privacy Challenges, University of Western Sydney Law Review Vol 17:41, 2013, pp. 48.

misidentification and wrongful convictions stemming from incorrect interpretations of DNA profile information.

Additionally, there are several problematic issues related to transnational DNA data exchange in the context of police and judicial cooperation. These include: lack of transparency in the use of DNA data; risk of false positives; lack of standardization in DNA analysis across countries; insufficient ethical oversight of cross-border law enforcement data exchange; potential violations of data protection regulations.[35]

3.1. Scope of Protection of the Right to Respect for Private and Family Life from the Perspective of the European Court of Human Rights

In analyzing the right to respect for private and family life, the concept of "private life" is very broad and may encompass multiple aspects of a person's physical and social identity (such as name, photograph, physical and moral integrity, etc.). On the one hand, there is a legal basis and consensus for collecting and storing biological data for specific legitimate purposes. On the other hand, such collection and retention of private data falls within the scope of the term "private life" as interpreted by the European Court of Human Rights (ECtHR). When assessing whether the personal data retained by authorities involve any aspect of private life, the ECtHR examines the reasons and purposes for which the data was recorded and stored, the nature of the records, the manner in which they are used and processed, and the potential outcomes that may result. This was confirmed in the landmark case of *S. and Marper v. the United Kingdom*. Although a DNA profile contains a significant amount of unique personal data, the ECtHR takes into account the nature of the data in question to determine the margin of appreciation afforded to states.[36] Application of Article 8 of the Convention to molecular genetic data may occur in several contexts: when the DNA profile, fingerprints, and photograph of a convicted person are taken and retained indefinitely;[37] when fingerprints and descriptions are taken from a repeat offender and kept for

[35] Machado, H., Silva, S., *op.cit*., pp. 2.
[36] Vodič kroz 8. članak Europske konvencije o ljudskim pravima - Pravo na poštovanje privatnog i obiteljskog života, Europski sud za ljudska prava, 2020, pp. 40.
[37] As in the case of Gaughran v. the United Kingdom, No. 45245/15 of 13 February 2020, paras. 63-70. See: Pilić, M., op.cit., pp. 280-281.

five years;[38] when there is a lack of safeguards for the collection, retention, and deletion of fingerprint records for individuals suspected—but not convicted—of a criminal offense.[39] Regarding the use of modern scientific techniques in the criminal justice system, the ECtHR has concluded that the protection guaranteed by Article 8 of the Convention would be unacceptably undermined if such techniques were allowed without careful balancing of the potential benefits of their broad application against the important interests of private life.[40] The judgment in *S. and Marper* found that general and indiscriminate collection of criminal records-related data constitutes a violation of Article 8(1) of the Convention, especially in the absence of clear and detailed legal provisions specifying the applicable safeguards. These provisions must govern, among other things, the conditions under which data can be collected, the duration of data retention, the purposes for which data may be used, and the conditions under which data must be destroyed. Thus, for the collection and retention of cellular samples in criminal investigations to be justified under Article 8(2) of the Convention, the action must be: "In accordance with the law"; pursue one or more legitimate aims listed in that paragraph, and be "necessary in a democratic society" to achieve that aim. The ECtHR's case law reflects different viewpoints but consistently emphasizes the same principle regardless of differing decisions in individual cases. In addition to *S. and Marper v. the United Kingdom*, other important cases where the taking and retention of DNA samples constituted an interference with the right to private and family life include *Gaughran v. the United Kingdom* and *Van der Velden v. the Netherlands*. However, there are also cases in which the collection and retention of DNA profiles of convicted persons for use in potential future criminal proceedings did not constitute a violation of Article 8 of the Convention.[41] The ECtHR's jurisdiction also highlights the importance of having a national normative framework that allows individuals to request the deletion of data related to them if retention is no longer deemed necessary in light of the nature of the criminal offense. Primarily, this concerns provisions of the Criminal Procedure Act, which form the basis for these evidentiary actions. They must be restrictive and specific in order to ensure the proper application of DNA analysis. The Croatian CPA prescribes retention periods: for a defendant later lawfully convicted

[38] Thus, in the case of P.N. v. Germany, No. 74440/17 of 11 June 2020, paragraphs 59-60; Vodič, *op.cit*., pp. 41.
[39] Thus, in the case of M.K. v. France, No. 19522/09 of 18 April 2013; Vodič, *loc.cit.*
[40] Case S. and M. v. the United Kingdom, § 112.
[41] Case Antonio Peruzzo v. Germany and Uwe Martnes v. Germany, Nos. 7841/08 and 57900/12 of 4 June 2013; Vodič, *op.cit.*

in criminal proceedings, data collected via molecular genetic analysis are retained for twenty years after the conclusion of the proceedings. Exceptionally, for offenses punishable by a prison sentence of ten years or more, or for sexual offenses punishable by more than five years of imprisonment, data may be retained for up to forty years after the conclusion of proceedings.[42] If the defendant is later acquitted, the proceedings are dismissed, or the indictment is rejected, the biological data is retained for ten years from the end of the proceedings.[43] DNA analysis data collected at the scene that are not matched to a specific individual are retained permanently.[44]

3.2. Protection of Personal Data from Molecular Genetic Analysis Samples

The protection of personal data also falls within the scope of Article 8 of the Convention, as interpreted by the ECtHR.[45] The use and disclosure of information related to an individual's private life, particularly when stored in a secret registry, is considered an interference under Article 8(1) of the Convention. The ECtHR has repeatedly emphasized the importance of implementing appropriate safeguards to prevent any use of personal data that is incompatible with the guarantees of the right to respect for private and family life. Moreover, the need for protective measures is even greater in cases where the data is processed automatically, including for police purposes.[46] Data derived from molecular genetic analysis contains highly sensitive information about individuals and, due to the nature of automatic processing, requires particularly careful and legally regulated handling. The expansion of DNA databases is often promoted as a means of achieving faster and more effective identification of criminal offenders.[47] At the same time, however, the growing volume of genetic data becomes an increasingly attractive target for misuse—not only by human actors but also through digital algorithms that process large quantities of data. Nowadays, tools for tracking and profiling individuals convicted even of minor offenses are used routinely.

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[42] Art. 327.a, paragraph 2 of the CPA
[43] Art. 327.a, paragraph 3 of the CPA
[44] Art. 327.a, paragraph 5 of the CPA
[45] Ibid, p. 42. Case Satakunnan Markkinapörssi Oy and Satamedia Oy v. Finland, No. 931/13 of 27 June 2017, para. 133.
[46] When applying DNA profiling techniques in criminal justice, it must be ensured that the right to privacy is not compromised in the process. Singh, D., DNA Profiling and Human Right: Issue and Challenges for Application in Administration of Criminal Justice, ILI Law Review Summer Issue 2022, pp. 165.
[47] In the United States, for example, the federal government and all fifty states have created permanent databases of DNA from an increasing number of categories of individuals and subjected these collections to regular searches., Gruber, J., Forensic Genetics: A Global Human Rights Challenge, Open Society Foundation, 2012, available at: https://www.opensocietyfoundations.org/voices/forensic-genetics-a-global-human-rights-challenge

Data collection practices are increasingly moving toward the permanent retention of both biological samples and the profiles of individuals who have been arrested, even if never convicted of a crime. As forensic DNA databases expand, a startling range of techniques has emerged, enabling laboratory technicians to extract information from DNA that goes far beyond mere identification. This gives law enforcement unprecedented access to the private lives of innocent individuals through their genetic information—often without a court order or individualized suspicion.Some of these techniques include: matching partial DNA samples from crime scenes to database profiles to generate lists of potential suspects based on familial relationships; creating probability profiles (including, but not limited to, race) of perpetrators based on DNA collected from crime scenes; covert collection and analysis of DNA remnants from objects such as cigarette butts and coffee cups; building local "offline" forensic DNA databases; plea bargains or deals in which charges for minor offenses are dropped in exchange for "voluntary" entry into the DNA database. Many of the systemic issues facing criminal justice systems are reflected in these practices, including racial disparities in arrests and convictions. For example, while African Americans make up only 12% of the U.S. population, their profiles represent 40% of the federal DNA database (CODIS). Globally, DNA databases differ significantly in terms of access, consent requirements, and retention of biological samples and the digital profiles created from them. Nevertheless, they all share a common flaw: insufficient protection for privacy and human rights. Efforts to facilitate the cross-border exchange of DNA data between countries have also grown rapidly, often occurring with minimal oversight.[48] In addition, familial searches in DNA databases have come under criticism, raising concerns not only for the individuals directly tested but also for many family members who become entangled in broader criminal investigations, including innocent people who may suffer life-altering consequences simply due to suspicion.[49] For example, in 2017, the New York State Division of Criminal Justice Services softened its policy on familial searching. Such searches were allowed but only under specific circumstances and during

[48] *Ibid.*

[49] On familial searches, see: Maguire, C.N., McCallum, L.A., Storey, C., Whitaker, J.P., Familial searching: A specialist forensic DNA profiling service utilizing the National DNA Database to identify unknown offenders via their relatives—The UK experience, Forensic Science International: Genetics 8 (2014), p. 1–9.

the review phase. This change was supported by district attorneys as well as by the father of a murder victim who publicly advocated for expanding DNA search capabilities.[50]

3.3. (Mis)use of Artificial Intelligence in the Use of Molecular Genetic Data

A particularly sensitive issue related to the use of molecular genetic data in criminal justice is the application of modern scientific technologies, such as artificial intelligence (AI), which is considered one of the strategic technologies of the 21st century. It offers significant gains in efficiency, accuracy, and practicality, thereby contributing positively to the European economy.[51] When it comes to molecular genetic data that are automatically processed and entered into forensic DNA databases, artificial intelligence may have multiple implications. On a global level, there is no universally accepted definition of artificial intelligence. However, what is known is that AI operates based on algorithms designed to process large quantities of data to achieve specific goals. When using the term "algorithm" in the context of human rights and its implications, it is important to consider not only established definitions but also the broad application of the term, which can vary depending on the context. One definition suggests that algorithms are not necessarily software-based but can be codified procedures for transforming input data into a desired output through a series of calculations. They are described as "a series of steps taken to solve a problem or achieve a defined outcome."[52] Therefore, in analyzing the impact of algorithms on human rights, attention should be focused on digital algorithms that affect the broader public, particularly algorithmic decision-making systems with implications for human rights. Automation is one of the core features of algorithmic decision-making. The ability of automated systems to replace human judgment in an increasing number of areas is a defining characteristic of practical algorithm deployment. A specific challenge of algorithmic processing of personal data is the generation of new data. When a data subject provides a few discrete pieces of information, it is often possible to combine them and generate second- or even third-generation data about the individual. This means that two innocuous pieces of information, when analyzed alongside a much larger dataset, can be

[50] Ahmed, A., Ethical Concerns of DNA Databases used for Crime Control, 7th Annual Health Law Year in P/Review, Genetics, Health Law Policy, 2019, available at: https://blog.petrieflom.law.harvard.edu/2019/01/14/ethical-concerns-of-dna-databases-used-for-crime-control/

[51] From the Explanatory Memorandum to the Report on Artificial Intelligence in Criminal Law and its application by the police and judicial authorities in criminal matters, A9-0232/2021, 13 July 2021.

[52] Pilić, M., Sigurnost sustava umjetne inteligencije u međunarodnom pomorskom prometu, Sveučilište u Zadru i Libertas međunarodno sveučilište, Zadar, 2022, pp. 163., note 653-654.

"amplified" and turned into completely new insights—insights that may be unpredictable and even unknown to the data subject.[53]

AI-powered algorithms may surpass human capability in interpreting complex datasets. However, their strength and complexity can also lead to erroneous, unethical, or even discriminatory conclusions when applied to data concerning human health. Without careful consideration of the methods and biases embedded in a trained AI system, the practical utility of these systems—especially in clinical diagnostics—remains limited.[54]

The use of profile data for various purposes through algorithmic processing raises serious concerns because such data often lose their original context. This repurposing of data can significantly impact an individual's autonomy and self-representation. Search engines and data aggregators contribute to this problem by facilitating the collection of personal information. The use of profile data—including those generated by search algorithms—directly affects the right to individual autonomy. Often, individuals are unaware that they are being profiled and that their data are being used beyond their original context. This diminishes the anonymity of data and makes personal information more easily discoverable. Additionally, algorithm-generated results may be incomplete, inaccurate, or outdated, potentially portraying individuals unfairly and leading to harmful consequences. Such profiling can be especially detrimental to children and their future.[55]

In response to the need to protect personal genetic and biological data, the concept of cyber-biosecurity emerged in 2018. It is defined as an interdisciplinary blend of cybersecurity, biosafety, and cyber-physical security. The aim of defining this new field is to understand vulnerabilities at the intersection of multiple disciplines, biomedical systems, and bioinformatics tools, and to develop strategies to mitigate risks and protect sensitive personal data from threats targeting individuals or organizations. In recent years, there has been a noticeable increase in cyberattacks targeting biological systems—including incidents in Croatia, such as cyberattacks on the

[53] *Ibid*, pp. 168.
[54] Dias, R., Torkamani, A., Artificial intelligence in clinical and genomic diagnostics, Genome Medicine, 2019, 11:70, pp. 8.
[55] *Loc.cit.*

University Hospital Centre (KBC) in Zagreb[56] and the Split Airport.[57] Ransomware attacks are one example of such breaches, prompting researchers to focus on developing methods for securing and safeguarding medical records, DNA, and genomic data.[58]

IV. Minimal Standards for the Protection of the Right to Privacy and Personal Data in the Application of DNA Analysis at the EU Level

A particularly important issue in the use of DNA analysis in criminal proceedings concerns cross-border cooperation among EU member states and the challenges that arise in terms of human rights—especially the right to respect for private and family life and the protection of personal data. In examining the minimum standards for the mutual admissibility of forensic evidence at the EU level, legal instruments that are not specific to forensics but provide a general legal framework have been used, such as Directive 2012/13/EU of the European Parliament and of the Council of 22 May 2012 on the right to information in criminal proceedings[59], and Council Decision 2008/615/JHA of 23 June 2008 on stepping up cross-border cooperation, particularly in combating terrorism and cross-border crime (hereinafter: the Prüm Decision).[60]

To this end, a study was conducted in 2019 at Ghent University on the common minimum EU standards for the admissibility of forensic evidence in criminal matters. The goal of the study was to examine the feasibility of developing minimum standards for investigative actions to achieve mutual admissibility of evidence. The focus was on three specific types of forensic and criminal justice investigative actions: DNA analysis, fingerprinting, and electronic evidence. In developing minimum standards at the EU level regarding the application of molecular genetic analysis in criminal proceedings, it has been noted that several specific forensic standards are

[56] https://www.vecernji.hr/vijesti/kiberneticki-napad-na-kbc-zagreb-situacija-nece-ugroziti-bolesnike-1780447
[57]https://cronika.hr/istaknuto/2024/kiberneticki-napad-splitsku-zracnu-luku-vratio-na-rucno-s-hakerima-se-nece-pregovarati/#google_vignette
[58] Arshad, S., Arshad, J., Khan, M.M., Parkinson, S., Analysis of security and privacy challenges for DNA genomics applications and databases, Journal of Biomedical Informatics 119, 103815, 2021, pp. 3.
[59] Directive 2012/13/EU of the European Parliament and of the Council of 22 May 2012 on the right to information in criminal proceedings, OJ L 142, 1.6.2012, pp. 1–10.
[60] Council Decision 2008/615/PUP of June 23, 2008 on deepening cross-border cooperation, especially in combating terrorism and cross-border crime, OJ L 210, p. 1–11.

already in place, which require special procedures for the protection of fundamental rights. During the collection phase[61], core principles come into play that may affect the mutual admissibility of evidence—namely, the right to privacy and the right to information, both of which may vary across jurisdictions. For example, elements such as: limiting DNA profiling to non-coding segments of DNA[62] and ensuring that the identity of the data subject is not disclosed to the expert creating the DNA profile (confirmed by the ECtHR in *Peruzzo v. Germany*)[63]. These elements are essential for protecting the right to privacy and shielding individuals from abuse and arbitrariness, and they should therefore be included in the list of minimum standards.[64] It is necessary to define: who has the authority to collect samples, for what purposes samples may be collected, and special attention must be given to vulnerable groups, such as children, ethnic minorities and individuals with disabilities or mental illnesses. Children should not be treated as suspects unless they have reached the age of criminal responsibility. However, in the case of children who have committed a criminal offense, specific provisions are needed regarding: when they are considered capable of giving informed consent for DNA collection, when samples may be taken without consent and whether the presence of a responsible adult is required during sample collection. Similar considerations apply to individuals who are not capable of providing fully informed consent for reasons other than age, such as mental illness or intellectual disability.[65]

In the storage phase, it has been observed that the right to privacy does not always require highly detailed standards across all three forensic disciplines. For identified DNA profiles, the right to privacy implies that profiles of suspects may be retained only for the period established by law, following a final court decision. Although the ECtHR has emphasized the special position of minors[66], this does not necessarily mean that minimum standards must include different retention

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[61] See three models of debates on DNA analysis in the investigative phase: Oosthuizen, T., Howes, L.M., The development of forensic DNA analysis: New debates on the issue of fundamental human rights, Forensic Science International: Genetics 56, 2022, pp. 1-10.

[62] With a view to the exchange of DNA analysis results between Member States, the latter are invited to set up these databases in accordance with the same standards and in a compatible manner. The possibility of exchange is limited to the exchange of data from the non-coding part of the DNA molecule, which can be assumed not to contain information on certain hereditary characteristics. Art. I. 2. of the Council Resolution of 9 June 1997 on the exchange of DNA analysis results (97/C 193/02)

[63] Case Antonio Peruzzo v. Germany and Uwe Martnes v. Germany, paragraphs 45-47.

[64] Depauw, S., In search of a free movement of forensic evidence: Towards minimum standards to determine evidence admissibility?, Journal of Forensic and Legal Medicine 74 102021, 2020, pp. 2-3.

[65] Forensic Genetics Policy Initiative, Establishing best practice for forensic DNA databases, 2017, pp. 18.

[66] As in the case of W. v. the Netherlands, No. 20689/08 of 20 January 2009, pp. 9.

periods for minors, even though some member states—such as the Netherlands[67], England, and Wales—prescribe differentiated periods. To safeguard the right to privacy and personal data protection, data subjects should always have the opportunity to challenge the necessity of continued data retention. Additionally, forensic DNA profiles should be based exclusively on non-coding DNA that does not reveal information about an individual's health or physical traits (aside from gender).[68]

In the retention phase, it is recognized that differences among member states regarding the duration of biological sample retention hinder the development of unified minimum standards. The lack of European-level guidelines leads to divergent national approaches, leaving states to regulate retention periods independently—either by setting statutory deadlines or linking retention to a final judicial decision and a predefined time frame. To meet the minimum standard while safeguarding the right to privacy, it is considered best to limit the retention period of DNA samples to a specific duration after the DNA profile is created and communicated to the data subject.[69]

Regarding forensic DNA databases, these often include, for example, databases of missing persons alongside databases of suspects or convicted individuals. Therefore, such data should be stored separately from DNA databases containing information about criminal offenders.[70] It is essential to clearly define: who has access to DNA databases, under what conditions and for what purposes. In addition, data accuracy must be ensured through regular checks and updates, and data security must be guaranteed through advanced technological solutions and strict access controls.[71]

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[67] See Article 18 of the Regulation on DNA Testing in Criminal Cases (*Besluit DNA-onderzoek in strafzaken*)
[68] Forensic Genetics Policy Initiative, *op.cit*., pp. 24.
[69] Depauw, S., *op.cit*., pp. 5.
[70] The United Arab Emirates (UAE) has been criticized for being the only country with a public policy of including the entire population in a DNA database. Wallace, H.M., Jackson, A.R., Gruber, J., Thibedeau, A.D., Forensic DNA databases–Ethical and legal standards: A global review, Egyptian Journal of Forensic Sciences, 2014, p. 60.
[71] Forensic Genetics Policy Initiative*, op. cit*., pp. 25.

V. Measures Taken to Protect the Right to Privacy and Personal Data in Molecular Genetic Analysis

In the context of using molecular genetic analysis as evidence in criminal proceedings, the issue of harmonizing and protecting the forensic use of DNA—both for the purpose of justice and for the safeguarding of human rights—becomes increasingly important, as these are two mutually dependent societal interests. It is undeniable that the use of this type of evidence, including the storage and retention of genetic data, falls within the scope of the Convention right to privacy. Some authors even advocate for individuals to have ownership rights over their genetic material, where the collection, processing, and storage of such material would require their explicit consent, and any violation would be treated as an offense.[72] On the other hand, there is a need and effort to establish as many DNA databases as possible and to collect as many samples as possible in order to quickly and effectively identify perpetrators, victims, or other persons of interest. One initiative that aims to directly influence the human rights standards applied to DNA databases around the world is the Forensic Genetics Policy Initiative, created through cooperation between GeneWatch UK, Privacy International, and the Council for Responsible Genetics. The goal of this initiative is to build the capacity of civil society globally to engage in policy-making processes related to the development of national and international DNA databases and the cross-border exchange of forensic information, while ensuring the protection of human rights through the establishment of international standards for DNA databases.[73] The issue of protecting the right to privacy and personal data becomes especially relevant in the context of cross-border data exchange involving biological samples from perpetrators, aimed at combating serious forms of crime. At the EU level, the automatic exchange and comparison of DNA data between national databases for the purpose of combating terrorism and cross-border crime has been made possible through the Prüm Decision, which enables the automated exchange of non-coding parts of DNA.[74] However, the possibility still remains for the exchange of personal data linked to individuals believed to be perpetrators of criminal acts.[75] Although the Prüm Decision has brought numerous benefits for the development and use of DNA evidence in criminal proceedings, the European Parliament, in its report,

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[72] Coodly, L.R., DNA and Its Privacy, Master's thesis, Harvard Extension School, 2019, pp. 5.
[73] Gruber, J., *op. cit.*
[74] Art. 2. Decision from Prum
[75] Art. 14. Decision from Prum

emphasizes the continued need for high standards in the exchange of forensic DNA data due to potential risks to privacy and data protection.[76]

At this point, it is also important to mention the European Network of Forensic Science Institutes (ENFSI)[77], a network of over seventy forensic institutions from European countries. Its goal is to ensure the quality and advancement of forensic science both in Europe and globally. In this context, Vision 2030 was developed to improve forensic science with a focus on: developing secure procedures for the use and exchange of biometric data, using artificial intelligence in forensic processes, integrating advanced technologies and digital methods[78] at crime scenes, and more.[79]

VI. Conclusion

The right to privacy and the right to the protection of personal data are inseparable components of the Convention right to respect for private and family life under Article 8 of the Convention. However, this right is frequently subject to violation within criminal proceedings, either as a consequence of certain procedural actions or as a standalone issue. One of the primary sources of potential infringement on this right is the use of molecular genetic analysis as evidence in criminal cases. This is because such analysis involves highly sensitive personal data about individuals, particularly when samples collected from crime scenes are stored and preserved in DNA databases that may be susceptible to misuse.

Data obtained through molecular genetic analysis contain a wealth of information—not only about the individual, but also about their diseases, predispositions, blood relatives, and more. For this reason, they require special protection, especially within the context of criminal procedure. When analyzing the limits of admissibility in the use of data from molecular genetic analysis, it becomes

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[76] European Parliament, Cross-border Exchange and Comprasion of Forensic DNA Dana in the Context of the Prum Decision, 2018, available at: https://www.europarl.europa.eu/RegData/etudes/STUD/2018/604971/IPOL_STU(2018)604971_EN.pdf

[77] Engl. European Forensic Science Area

[78] On digital forensic evidence see: Klasen, L., Fock, N., Forchheimer, R., The Invisible Evidence: Digital Forensics as Key to Solving Crimes in the Digital Age, Forensic Science International, 2024.

[79] ENFSI, Vision of the European Forensic Science Area 2030, "Improving the Reliability and Validity of Forensic Science and Fostering the Implementation of Emerging Technologies", available at: https://enfsi.eu/wp-content/uploads/2021/11/Vision-of-the-European-Forensic-Science-Area-2030.pdf

clear that greater attention is often given to the first of two interdependent societal interests—namely, the need to exchange biological data for the purpose of criminal prosecution—over the second, which is the protection of personal data and the individual's right to privacy. Although the European Court of Human Rights has repeatedly affirmed the obligation to respect the Convention right to privacy and the protection of personal data, today's technological advancements and the expansive development of artificial intelligence place biological data under numerous new threats. The minimum standards that could ensure the protection of these rights in the context of DNA analysis include: restricting DNA profiling to non-coding segments of DNA, ensuring that the identity of the data subject is not disclosed, special consideration for vulnerable groups and their ability to provide informed consent for the collection of biological samples, harmonization of retention periods for biological materials across EU member states, additional measures that should be undertaken to protect these rights include: separating DNA databases (e.g., those of missing persons from those of convicted offenders), obtaining informed consent from individuals before collecting biological material, limiting access to DNA databases, and similar safeguards. All of these steps require further action from both EU institutions and national authorities in order to establish not only a normative but also a practical framework that protects the Convention right to privacy and the right to the protection of personal data.

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Доц. Д-р Маја Пилиќ[80]

СОДРЖИНА НА ПРАВОТО НА ЗАШТИТА НА ПРИВАТНИОТ И СЕМЕЈНИОТ ДОМ И ПРАВОТО НА ЗАШТИТА НА ЛИЧНИТЕ ПОДАТОЦИ ПРИ КОРИСТЕЊЕ НА ДНК АНАЛИЗА КАКО ДОКАЗ ВО КРИВИЧНАТА ПОСТАПКА

Резиме

Молекуларно-генетската анализа претставува многу сигурно и ефикасно средство на доказување бидејќи овозможува идентификација на сторителите на кривични дела, жртвите и нивните блиски роднини. ДНК-анализата се состои од низа поврзани постапки како што се екстракција и анализа на ДНК, чување на податоците добиени преку ДНК анализа и нивна понатамошна употреба. Таа претставува вид на вештачење чија основна цел е откривање, докажување и спречување на кривични дела, но нејзината злоупотреба може да доведе до ограничување или повреда на основните човекови права и слободи, а на крајот и до ослободување на неправедно осудени лица.

Идентификацијата на лице врз основа на ДНК вештачење се смета за најефикасна техника за идентификација на лице, односно осомничени, врз основа на биолошки материјал оставен на местото на кривичното дело и е незаменлива во решавање и докажување на голем број кривични дела. Форензичката ДНК технологија се користи за анализа на ДНК профили кои обично потекнуваат од човечки ДНК примероци. Овие примероци може да се соберат од местото на настанот или од телата на осомничените или жртвите, а ДНК профилите потоа се споредуваат со веќе складирани профили во ДНК базата на податоци со цел идентификација на совпаѓања.

Сепак, податоците од ДНК анализата претставуваат генетски податоци кои, согласно Регулативата (ЕУ) 2016/679 на Европскиот парламент и на Советот од 27 април 2016 година за заштита на физичките лица во однос на обработката на личните податоци и за слободно движење на таквите податоци, и со која се укинува Директивата 95/46/ЕЗ, спаѓаат во категоријата на лични податоци поврзани со здравјето на лицето и како такви е забрането да се обработуваат освен во случаи предвидени со Регулативата.

[80] Доцент Унив наерзитетскиот оддел за форензички науки, Универзитет во Сплит; Доцент на Правниот факултет, Универзитет во Мостар. Контакт: maja.pilic@forenzika.unist.hr.

Дополнително, собирањето на податоци од ДНК примероци без согласност од осомниченият или друго лице претставува повреда на правото на физички интегритет, а нивното задржување и чување претставува повреда на правото на почитување на приватниот и семејниот живот согласно член 8 од (Европската) Конвенција за заштита на човековите права и основните слободи.

Од друга страна, имајќи ја предвид сè поголемата застапеност на вештачката интелигенција во сите општествени сфери, вклучително и во областа на кривичното право и правдата, нејзината способност за користење податоци и алгоритми може да претставува одреден ризик за генетската информација содржана во ДНК примероците. Неовластен пристап или злоупотреба на ДНК примероци може да го загрози правото на приватност на поединецот, поради што е неопходно воспоставување нормативни и безбедносни мерки за да се обезбеди користење на таквите генетски податоци само за конкретни цели и нивно безбедно чување.

Во овој труд, авторот се стреми да ги утврди границите на дозволеноста и содржината на правата што се засегнати со користењето на ДНК анализата како доказ, а особено конвенциското право на заштита на приватниот и семејниот живот и заштитата на личните податоци добиени од примероци на биолошки материјал. Целта е да се анализира како да се обезбеди заштита при форензичката употреба на ДНК во интерес на спроведување на правдата и заштита на човековите права како два меѓузависни општествени интереси.

Клучни зборови: молекуларно-генетска анализа, право на заштита на приватен и семеен живот, генетски податоци, заштита на лични податоци, вештачка интелигенција.