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## REVIEW OF RECENT DEVELOPMENTS ON THE BIOETHICS OF DNA PROFILING IN DIFFERENT COUNTRIES

*This article reviews publications about public debates on DNA profiling from different viewpoints in various countries and searches for key similarities and differences. The author of the article comes to the conclusion that substantial efforts are needed in order to reduce gender and ethnic biases in national DNA databases in both developed and developing countries as well as to improve the operation of existing national DNA databases in developing countries through solution of technical, legal and ethical problems.*

**Keywords:** forensic science; ethics; human rights; forensic DNA; national DNA databases; DNA profiling; public opinion

### Introduction.

DNA profiling became accepted as one of the most important identification techniques in forensics. However, its effective application in crime investigation requires the creation of reference data base of human DNA profile in order to match a trace DNA sample recovered from the crime scene to a suspect.

Furthermore, the research in forensic DNA biology continuously enlarges the possibilities of human identification and has made it possible to progress from general identification of an individual by using short tandem repeats to more specific areas of biogeographical ancestry search using mitochondrial DNA and external visual characteristics using related nuclear genes.

All this has sparked a vigorous public debate on utility of common good versus protection of civil rights of citizens in case of universal DNA profiling and data-basing in western world. In terms of common good, DNA database entails better resolution of crimes, whereas, in terms of civil rights, citizens are concerned about proper use of their genetic data in relation to various political, economic and social reasons.

Moreover, in developing countries, challenges in the process of establishment of national DNA databases include technical and legal problems with operation of DNA database and DNA collection as well as inadequate research on STR profiling in populations.

Finally, in many Muslim countries, validity of DNA profiling in courts is dependent on specificity of national legislation which includes Islamic legal institutions and is considered by many authors in terms of Islamic bioethics and traditional Muslim norms.

### Main part.

According to the literature sources, in western world, public debate on DNA profiling revolves around the concepts of law-abiding citizen, including the distinction between criminals and non-criminals, regulations and human rights, including equality, access, control and privacy, and societal benefits, including advantages of national DNA database for the society.

The example of current discussion on bioethics of DNA profiling in literature in Western Europe is given in **Zieger and Utz, 2015**. The paper discusses utility of Swiss National DNA Database in public security versus civil rights of minorities.

The authors present the results of their survey on the use of genetic analysis of externally visible characteristics and biogeographical ancestry in forensics. According to the results of the study, the majority of Swiss respondents, both men and women, oppose the idea of national DNA database (55%) due to the lack of confidence in data security and lack of privacy. Moreover, people from the field of police, judicature and forensics, presumably more familiar with the topic, did not give significantly different answers.

One of the methodological problems of the survey mentioned by the authors is the usage of snow ball sampling technique which gives overrepresentation of people interested in the topic over the entire population so that the results of the study could be significantly different than actual Swiss public opinion.

The results of the survey revealed that women and the young, in general, are more receptive of the idea of DNA database. Moreover, most respondents did not indicate in their comments how the data could be abused. But a few respondents, answering in more detail, mentioned the fear of a leakage to insurance companies or employers. This would not be an issue if only standard STR profiles were stored and no total DNA samples kept. In fact, current Swiss legislation specifies that total DNA samples from suspects ought to be destroyed after establishment of a standard STR profile for national database registration [1].

Similarly, **Machado and Silva, 2014** surveyed 628 individuals in Portugal on the issue of willingness to donate voluntarily their DNA samples for profiling and inclusion into the National Forensic DNA Database. According to the published results, the majority of respondents were willing to accept inclusion of individual genetic profile in the National Forensic DNA Database either unconditionally (42%) or with some reservations (28%).

However, the authors used public universities mailing lists and snow ball technique for distribution of the questionnaire, which produced unequal gender, social and economic representation in the sample in favor of females, university graduates, employed and middle class. As a result, factual public opinion on DNA profiling in Portugal could differ from the obtained results.

Nevertheless, the results of the survey show that there is a significant correlation between socioeconomic factors and individual position on willingness to submit one's DNA into National Forensic DNA Database in Portugal indicating that women, the young, and the more educated tend to support the concept of national DNA database [2].

Although the number of crimes detected involving DNA match has been growing steadily over the last decade and comprised 0.36% of the total amount of crimes detected, the concern on civil rights and liberties as well as on the ways of DNA data collection has been raised by **Wallace, 2014**. It has been pointed out that the main source of DNA profiles into forensic national databases came to be not only convicted individuals but also arrestees without conviction, suspects cleared in an investigation, or even innocent people never charged with an offence.

Moreover, large national databases as the NDNAD (National DNA Database) of England and Wales are likely to be skewed socioeconomically so that the poor, immigrants, males and blacks became overrepresented. It has been pointed out that the majority of DNA samples were taken in minor offences such as shop lifting but not in murders. For instance, according to *GeneWatch*, in Germany 63% of the database matches provided are related to theft while less than 3% are related to rape and murder [3].

One of the probable reasons for ethnic and gender bias in a national forensic DNA database could be the manner of DNA collection from police, military, and convicted persons. These groups of population are known for ethnic and gender inequality in the majority of countries. However, despite concerns on human rights, the expansion of forensic DNA database on the expense of innocent people, volunteer donors and other groups of population such as students, health care and social welfare workers could potentially reduce ethnic and gender bias. Nevertheless, accepted international norms on DNA collection based on the principles of voluntary DNA donation from innocent people have limited the expansion of the majority of national forensic DNA databases until now. Thus, the problem of national DN database expansion and eradication of ethnic and gender biases remains largely unsolved.

Finally, it is important to emphasize that European public opinion on DNA database has recently become more critical and educated. According to **Roewer, 2013**, in 2005, the incoming government of Portugal proposed a DNA database containing samples from every Portuguese citizen. Following public objections, the government limited the database to criminals. In Portugal, the issue is characterized by growing public awareness on the benefits and risks of very large DNA collections. The majority of Portuguese respondents indicate that

common ethical and privacy standards for the development and governance of DNA databases need to be adopted so that citizens' perspectives are taken into consideration.

The evolution of public opinion, public policy and bioethics on DNA profiling could be traced using the example of the oldest DNA database, UK National DNA Database, which was established in 1995. At the beginning, during the period of 1995-2001, the idea of national DNA database enjoyed a widespread public support. Then, in 2001-2004, several laws were adopted in UK which allowed DNA profiles to be kept on the Database even when a person was acquitted of a crime and allowed DNA to be taken as soon as a person is arrested, rather than waiting for them to be charged with an offense [4].

The period from 2004 until now could be characterized by the search of a compromise between the need for a comprehensive national DNA database and growing public concerns on protection of human rights in the area of DNA records, representing an interplay between utilitarian ethics of the usage of DNA Database for crime investigation versus Kantian ethics of protection of human rights and liberties in the field of DNA profiling as the basis of modern democracy.

According to **Roewer, 2013**, some of these concerns found in media and surveys include: being treated like a criminal (unfairness); the growth of a 'Big Brother' state and potential misuse of data by government (tracking individuals or groups of people or their families); potential loss of data or misuse of data (including by corrupt police officers, commercial providers or infiltrators); the implications of having a 'criminal' record for the rest of their life (including implications for employment, visas or treatment by the police); and the possibility of being falsely accused of a crime.

As a result, the Protection of Freedoms Act 2012 was adopted in UK and the National DNA Database was limited to DNA profiles of people convicted of serious offenses rather than extended onto the whole population. Moreover, in the course of the public debate in UK, a number of important questions have been raised and answered differently in various countries.

For instance, one of the most important questions on DNA profiling: **"Who should the police be allowed to take DNA from?"** has been answered differently in various countries. In EU, this issue is being regulated by the Marper judgement, European Court of Justice, 2008, which states that the retention of DNA and fingerprints from innocent people is the breach of the human rights law, so that DNA profiles can be taken only from people alleged to be involved in serious offences such rape, murder, or terrorism and kept only if these people are found guilty and destroyed otherwise. Thus, the retention of DNA from non-convicted or innocent individuals is not acceptable in EU or UK.

On the other hand, in US, the collection of DNA samples into Federal DNA Database (CODIS), established in 1998, and the National DNA Index (NDIS) is regulated by various federal and state laws, some of which allow collection of DNA samples prior to conviction for a range of offences in several states, whereas, in other states, collection or analysis is permitted to occur only after changing, arraignment, indictment, or judicial determination of probable cause [5].

Similarly, DNA database legislation has been adopted in 64 countries, ranging from DNA collection from innocent people to the convicted. On the one pole, there are EU and UK, where DNA is only allowed to be taken from those found guilty in serious offences, whereas, on the other extreme, there are some Arab and Central Asian countries, such as Kuwait, United Arab Emirates and Uzbekistan, which are in the process of adopting legislation to put their entire population and all visitors on a DNA database, with US and the majority of other countries in the middle of this spectrum [6].

Furthermore, the police are not the only institution which is allowed to collect DNA. For instance, Sri Lanka has a privately-run DNA database but has subsequently established a government laboratory and is planning a national forensic DNA database. One of the crucial points here is to ensure that those involved in the criminal justice system understand forensic bioinformatics. For instance, there is a need to upgrade DNA profiling systems due to increasing recognition in both the EU and the USA, that the growing number of DNA database searches, including across borders, could lead to an increasing number of adventitious DNA matches occurring simply by chance. Moreover, more research is needed to investigate the discriminatory power of DNA profiles in terms of allelic frequencies of specific STR in large populations, such as China and India, or countries with much larger average family size and greater inter-relatedness due to consanguinity and endogamy than is typical in the EU or the USA [6].

Finally, despite an emerging consensus on best practice in DNA profiling, many countries have yet to develop national legislation on DNA profiling and database and to adapt it to their specific societal norms and features of their populations. In case of developing countries, there is also lack of resources for critical police training to secure traceability of forensic evidence from the crime scene to DNA profiling laboratory and from there to the court, including the necessary safe-guards to prevent DNA contamination [7].

Current challenges in the process of the development of national legislation on DNA profiling in developing countries could be well illustrated using the case of India. Human DNA Profiling Bill, first proposed in 2007, is intended to establish national DNA database and regulations of DNA profiling in India. One of the biggest challenges is the absence of the previous legislative experience in the field of DNA so that the drafted bill is expected to address a wide range of issues, such as regulation of DNA profiling, chain of custody, data storage, search and retrieval, as well as interaction with already existing civil and criminal laws [8].

For instance, **Verma and Goswami, 2014** mention potential loopholes and technical drawbacks in the proposed Human DNA Profiling Bill of India. In particular, the bill fails to address such an important topic in India as medical transplantation of bone marrow so that to avoid erroneous matches of DNA profiles between the donor and the recipient in case, when one of them is alleged or convicted of crime. Moreover, not all Indian courts in different states recognize DNA evidence for civil law court hearings as compulsory, for example, in parenthood cases. The bill is also limited in areas of DNA theft, DNA fabrication, DNA forge and intentional planting of biological evidence.

According to **Verma and Goswami, 2014**, the weakest points of the Human DNA Profiling Bill of India, 2007 are inadequate measures to safe-guard DNA collection, chain of custody in licensed DNA profiling laboratories in order to prevent DNA theft and unintended or intended contamination, consent from those under trial and convicts, and the period of time for keeping DNA in the database. Moreover, the authors criticize the procedure of accessing the database, which is supervised by the general management, either upon or without the request of the courts or the police which could potentially lead to the misuse of DNA data, whereas the accessing the database upon the authorization of the courts only could prevent or limit the potential misuse of DNA data.

It is necessary to point out that these problems are characteristic of many developing countries which are in the process of establishing their national forensic DNA profiling database and adopting necessary legislation for its function. Many of these nations, such as Kuwait, United Arab Emirates or Uzbekistan, and, to some extent, India, are currently experiencing the push for stronger surveillance regimes and passing legislation that permits law enforcement agencies easy access to individually identifying genetic material. Thus, DNA profiling database is seen more as a tool for political control for the benefit of a few rather than crime investigation for the benefit of all [9].

This could further increase doubts in the minds of people against state intervention into personal affairs and violation of the right for privacy. Moreover, many of these countries are not yet adequately prepared to bring DNA legislation at operational level. Consequently, this could lead to more harm than good to the people creating the state of dilemma: on the one hand, launching of DNA database without adequate regulation in order to address a number of vital issues for these nations, ranging from fight against terrorism and crime to political surveillance, versus DNA data abuse and violation of human rights on the other hand. The solution to this dilemma is envisioned as a further development of legislation and the solution of technical and legal problems of running national DNA database as well as anthropometric and biometric databases for convicts as well as for innocent people for personal identification.

Next, in Muslim countries, validity of DNA profiling evidence is subject to local Islamic laws and fractioning between jurists holding different views on modernization of current legal practices. In some cases, Islamic layers seek to harmonize DNA evidence with the existing Islamic norms. For instance, according to **Haneef, 2015**, in Malaysia, some jurists advocate harmonization between Islam and DNA science in order

to overcome the problem of 'paternity fraud' and 'misattributed paternity', whereas others either support the supremacy of old established common law principles of 'presumption of paternity' and 'ex parte' judgment or reject them in favor of western legal practices.

However, this issue has not only legal methodological character but it is also polemical in terms of social acceptability for common people, particularly to solve the problems of rapes, illegitimate births and pregnancies. Therefore, in a Muslim country, successful introduction of DNA profiling in common legal practices requires support of relevant political and social institutions in the society.

For example, the Council of Islamic Ideology in Pakistan declared that DNA profiling is inadequate for rape crimes and that other evidence is needed by Islamic law such as Hudoob ordinance. The basis for that decision is that DNA testing does not distinguish between forced and consensual intercourse, which are taken into consideration in Islamic law in Pakistan when dealing with rape crimes. As the function of DNA profiling is to identify the criminal, the questions of consensual versus violent intercourse are outside of the scope of the method. Then the identity of an accused rapist needs to be verified and, in case of the match of DNA of an accused with the DNA recovered from the crime scene, DNA evidence is very strong unless the accused has an identical twin [10].

On the other hand, traditional Islamic law in Pakistan requires confession or confirmation from four adult male eyewitnesses, including a physician for conviction of a rapist. The Islamic authorities seem to fail to understand that with DNA evidence, the issue is no longer constrained to eyewitnesses or medical examination, but it could instead be a physical evidence of forced sex such as DNA profiling.

Although the Islamic authorities recognize DNA testing as a useful and modern technique for supporting evidence, they state that it could not be used as primary evidence alone. The court of law could take decision in light of DNA test when it was used with other evidences as supporting material. Moreover, the norms of Islam are given in Hudoob Ordinance of 1979, which sets specific procedures to determine crime cases of rape based on the testimonies from the female victim and males, involved in the case either as witnesses or as examination experts [12].

According to **Hussain and Mushtaq, 2013**, rape crimes in Pakistan are currently not accountable to civil law, which widely uses DNA evidence, but are judged according to the Hudoob Ordinance of 1979, which faces mounting criticism from human-rights organizations and moderate sectors of civil society for discrimination of female testimony and expertise. By diminishing the importance of DNA testing, the council seems to be endorsing the stance of the Hudoob Ordinance. However, DNA testing is urgently needed in cases of child abuse, when geographical location precludes the presence of eyewitnesses, or when the rape victim is murdered. Thus, according to the paper, the collaboration between forensic scientists and religious scholars would improve mutual understanding and facilitating more informed decision-making based on DNA testing.

#### **Conclusion.**

DNA profiling has become an intrinsic part of legal practices worldwide. However, substantial efforts are needed to reduce gender and ethnic biases in national DNA databases in both developed and developing countries as well as to improve the operation of existing national DNA databases in developing countries through solution of technical, legal and ethical problems. Moreover, in some countries, DNA collection and construction of national forensic DNA databases are perceived as a tool of political control rather than a method of crime investigation. Finally, in many Muslim countries, cooperation between forensic scientists and Islamic scholars is needed to introduce DNA evidence into all types of legal practices.

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#### **ДНҚ ТАЛДАУЫНЫҢ ӘРТҮРЛІ ЕЛДЕРДЕГІ БИОЭТИКА САЛАСЫНДАҒЫ СОҢҒЫ ЖАҢАЛЫҚТАРДЫ ШОЛУ**

**Түйін:** Бұл мақалада ДНҚ талдауы бойынша әртүрлі елдердегі түрлі көзқарастар бойынша қоғамдық пікірталастарға арналған жарияланымдар қарастырылған және олардың негізгі ұқсастықтары мен айырмашылықтары анықталған. Автор дамыған және дамушы елдерде ұлттық ДНҚ деректер базасында гендерлік және этникалық кемшіліктерді азайту үшін елеулі күш қажет деп қорытындыға келді. Сонымен қатар техникалық, құқықтық және этикалық мәселелерді шеше отырып дамушы елдерде қолданыстағы ұлттық ДНҚ деректер базасының жұмыс істеуін жақсарту мүмкін болады.

**Түйінді сөздер:** сот медицинасы; этика; адам құқығы; сот ДНҚ; ДНҚ ұлттық деректер базасы; ДНҚ талдау; қоғамдық пікір.

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#### **ОБЗОР ПОСЛЕДНИХ РАЗРАБОТОК В ОБЛАСТИ БИОЭТИКИ ПО АНАЛИЗАМ ДНК В РАЗНЫХ СТРАНАХ**

**Резюме:** В этой статье рассматриваются публикации, касающиеся общественных дискуссий по анализам ДНК с разных точек зрения в разных странах и поиск ключевых сходств и различий. Автор статьи пришел к выводу, что необходимы значительные усилия для сокращения гендерных и этнических предубеждений в национальных базах данных ДНК как в развитых, так и в развивающихся странах, а также возможное улучшение функционирования существующих национальных баз данных ДНК в развивающихся странах путем разрешения технических, правовых и этических проблем.

**Ключевые слова:** судебная медицина; этика; права человека; судебная ДНК; национальные базы данных ДНК; ДНК анализ; общественное мнение.