THE LEGITIMACY OF USING GENETIC FINGERPRINTING IN CRIMINAL EVIDENCE -A COMPARATIVE STUDY-

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Abstract:

Since truth is an eternal quest of mankind, its understanding in the criminal domain is the primary condition for criminal justice and a necessity for achieving social security and stability. Uncovering the judicial truth is the purpose and goal of criminal proceedings. The principle of freedom of evidence is one of the fundamental pillars of this theory, which opens the door to the extensive use of scientific evidence in criminal evidence. Given the inadequacy of traditional means, both legal and technical, in criminal evidence, modern scientific evidence has emerged, including what is commonly referred to as genetic fingerprinting. Scientifically, this method is currently infallible in identifying individuals due to its unique characteristics. Western countries have different views on the legitimacy of this evidence, and have created databases specifically for the genetic fingerprints of certain criminals, and have allowed the storage of these fingerprint results. In contrast, some Arab countries have given it a prominent practical place, while others consider it unsuitable as an independent means of evidence and permit its use only under specific conditions and legal guidelines.

***Keywords**: evidence, legitimacy, genetic fingerprinting, Western legislation, Arab legislation.*

INTRODUCTION:

If crime is a product of human society, then uncovering it and identifying its perpetrators is the driving force and goal behind all that human intellect has devised through successive political systems. Since truth is an eternal quest for humanity, surrounded by a vast array of knowledge branches, knowing it in the criminal domain is the primary condition for criminal justice and a necessity for achieving social security and stability.

Judicial truth consists of facts obtained through a series of procedural channels defined by law in accordance with criminal procedure. It serves as a realistic model of how a criminal incident occurred, how it was committed, and who participated or contributed to it. Consequently, a judicial decision in criminal cases is the result of criminal proceedings and the embodiment of judicial truth, which has long been the cornerstone of such decisions. Therefore, it is obvious that both jurists and the judiciary agree that the discovery of judicial truth is the purpose and goal of criminal trials. One cannot deny the impact of scientific and technological progress on criminal law, especially on the theory of criminal evidence. The principle of freedom of evidence is one of the fundamental pillars on which this theory is based, thus opening the door for law enforcement agencies to make extensive use of scientific evidence in criminal prosecutions.

Given the inadequacy of traditional means, both legally and technically, in criminal evidence, modern scientific evidence has emerged that reveals the crime and attributes it to the accused. However, some of these methods remain subject to skepticism and are the subject of much debate among legal scholars regarding the legitimacy of their use in criminal evidence, as some argue that these methods violate the fundamental human rights that most of the world's constitutions have established must be protected and not violated.

Since each individual possesses a unique genetic makeup that science has yet to show can be shared with anyone else, this unique pattern is commonly referred to as genetic fingerprinting. Therefore, it is considered scientifically infallible in identifying individuals at the time of writing this. This subject becomes particularly significant when it involves identifying the perpetrator and proving the attribution of the crime to them using genetic fingerprinting.

Genetic fingerprinting is now considered an ideal form of evidence, since the analysis of DNA material found in a drop of blood, hair, saliva, or even semen found on the victim's body or at the scene of a crime is sufficient to identify the criminal. The importance of the consent of the individual subjected to genetic fingerprinting cannot be overemphasized, especially when it comes to procedures that violate human bodily integrity. Consent must be a fundamental aspect of such procedures. Thus, can a suspect be subjected to procedures that violate his or her bodily integrity under the pretext of uncovering the truth, even if such actions require coercion or violence to obtain the necessary samples? This brings us to the following question: What is the legitimacy of using genetic fingerprinting as evidence to prove crimes committed by offenders in various criminal laws?

In order to answer this question, we have adopted a descriptive and comparative methodology, which we believe is the most appropriate for this study. We have divided the topic into two sections:

Section One: The Nature of Genetic Fingerprinting

Section Two: The Legitimacy of Evidence Derived from Genetic Fingerprinting Tests in Different Legislations

Section One: The Nature of Genetic Fingerprinting

Genetic fingerprinting allows for the identification of an individual through the analysis of DNA concentrated in the nucleus of their cells. It is inherited from ancestors to descendants and serves to define the identity of each individual. This laboratory result was discovered following a series of medical findings, characterized by various properties, and legal scholars have differing opinions on its legal nature. This will be studied in this section.

Subsection One: The Concept of Genetic Fingerprinting

Genetic fingerprinting refers to the inherited traits passed from ancestors to descendants, which define the identity of each individual. It is a laboratory result discovered after a series of medical findings and has been defined in various ways, which we will explore in this subsection.

First Branch: Definition of Genetic Fingerprinting

The Genetic Engineering and Genetics Conference, sponsored by the Islamic Organization for Medical Sciences, defined genetic fingerprinting as genetic evidence, meaning the detailed genes that indicate the identity of each individual[1]. Legal scholars have defined genetic fingerprinting as the hereditary traits passed from ancestors to descendants, which serve to identify each individual through the analysis of a portion of the DNA contained in their body's cells. Others defined it as identifying a person by analyzing a part of the DNA concentrated in the nucleus of their body cells[2].

In this context, genetic fingerprinting refers to the genetic structure resulting from the examination of one or more genetic markers. Deoxyribonucleic acid (DNA) is a nucleic acid that

[1]- Seminar on Genetics, Genetic Engineering, Human Genome, and Gene Therapy— Kuwait — Sponsored by the Islamic Organization for Medical Sciences held from October 13-15, 1988 — Part Two, Year 2000, p. 1050.

[2]- Dr. Saad Al-Din Mas'ad Helali — "Genetic Fingerprinting and Its Legal Relations — A Comparative Study" — Scientific Publishing Council — Kuwait 2001, p. 35.

carries genetic information in the cell and is capable of self-replication[3]. This acid consists of two strands of nucleotides twisted in a double helix, connected by hydrogen bonds, with the sequence of nucleotides determining individual genetic traits. It is found in the cells of all living organisms, representing hereditary traits passed from ancestors to descendants, which define the identity of each individual through the analysis of a part of the DNA contained in their body cells.

Genetic fingerprinting is also defined as the identification of an individual through the analysis of DNA concentrated in the nucleus or cell of their body. This analysis appears in the form of a band of two strands, each strand arranged in a sequence based on the specific base pairs of the DNA unique to each individual. The space between the horizontal lines represents one of the strands (the genetic traits from the father) and the other strand represents the genetic traits from the mother[4].

Second Branch: The Discovery of Genetic Fingerprinting

Genetic fingerprinting is a laboratory result discovered after a series of medical findings, which we will clarify as follows:

In 1865, Mendel discovered genetic traits. In 1953, American scientist James Watson and British scientist Francis Crick discovered the chromosome from which the DNA strands are formed, earning them the Nobel Prize. Since then, the concept of genetic fingerprinting has emerged among legal scholars and jurists, who have researched and studied it[5].

Genetic fingerprinting was not recognized until 1984 when Dr. Alec Jeffreys, a geneticist at the University of Leicester in London, published research indicating that genetic material can repeat multiple times and reproduce itself in random, incomprehensible sequences. He continued his research and, after one year, found that these sequences are unique to each individual and can only be similar in identical twins. The probability of two genetic fingerprints being alike between two individuals is one in a trillion, making such similarity impossible, as the Earth's population does not exceed six billion at that time. Dr. Jeffreys patented his discovery in 1985 and referred to these sequences as human genetic fingerprints or the human DNA fingerprint, marking the first analyses of genetic fingerprinting. He explained the methods of deriving genetic fingerprints from saliva residue on postage stamps[6].

Subsection Two: The Legal Nature of Genetic Fingerprinting Tests and Their Characteristics

Views differ regarding the legal nature of genetic fingerprint analysis, with some considering it an act of search, while others regard it as a form of medical expertise. The variety of sources for genetic fingerprints allows these fingerprints to be derived from any human remnants, and they possess a set of characteristics, which we will examine in this subsection.

First Branch: The Legal Nature of Genetic Fingerprinting Tests

Opinions vary on defining the legal nature of DNA analysis. Some view it as an act of search, while another segment of legal scholars considers it medical expertise. A third viewpoint disagrees with this classification, asserting it falls under medical expertise[7].

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[3]- Badr Khaled Al-Khalifa — "The Legal and Technical Regulation of Genetic Fingerprinting" — Journal of Kuwait International Law College — Kuwait University, Issue 2, 2019, pp. 29-30.

[4]- Dhaif Allah Bin Ghazi Nasser Al-Odaiyani — "The Admissibility of Genetic Fingerprinting in Criminal Evidence" — Journal of Islamic Studies and Academic Research — Cairo University, Issue 72, p. 169.

[5]- Dhaif Allah Bin Ghazi Nasser Al-Odaiyani — "The Previous Reference," p. 180.

[6]- Ali Abdul Sharad — "Lectures at the College of Education for Pure Sciences" — Lecture Five — University of Anbar, Iraq, p. 56.

[7]- Dr. Abdullah Abdel Ghani Ghanem — "The Role of Genetic Fingerprinting in Combating Crime" — Research presented at the Conference on Genetic Engineering between Sharia and Law — United Arab Emirates University, May 5-7, 2002, Volume Two, p. 125.

The First Trend: This perspective treats genetic fingerprint analysis as an act of search, a view supported by a majority of French legal scholars and endorsed by Egyptian legal scholars. They argue that the results of genetic fingerprint analysis are akin to those of blood and urine tests, as they aim to uncover evidence in a crime, which inherently falls within the scope of a search[8].

The Second Trend: This viewpoint holds that blood analysis and similar tests for evidentiary purposes are acts of medical expertise. The same applies to the sources of genetic fingerprints, such as hair, saliva, nails, and semen[9]. Proponents of this view argue that all these sources are biological samples and secretions separate from the human body[10].

However, what is important for our research is that whether genetic fingerprinting is classified as an act of search or medical expertise, in both cases, it is regarded as physical evidence or circumstantial evidence that may influence the judiciary in forming its conviction. Furthermore, some criminal law scholars consider physical items found at the crime scene, those in the possession of the accused, or even within their body, as forms of circumstantial evidence[11].

Second Branch: Characteristics of Genetic Fingerprinting

Genetic fingerprinting has several characteristics, including:

The diversity of sources for genetic fingerprints allows for the creation of these fingerprints from any human biological waste, such as blood, saliva, and semen, or tissues like skin, bones, and hair.

The effectiveness of genetic fingerprinting relies on the fact that the sequence of nitrogenous bases differs from one person to another, with no two individuals on Earth being identical except in the case of identical twins.

Scientific studies demonstrate that DNA can withstand adverse weather conditions, particularly high temperatures. Genetic fingerprints can be created from dried blood or biological contaminants that have existed for a long time, as well as from bone remnants, in addition to any biological contaminants collected from the crime scene, such as hair, skin, blood, and semen.

DNA fingerprints are resistant to decomposition for extended periods, lasting several months, regardless of how small the sample is. Thus, they can be used as technical evidence through specific testing, where the DNA in the sample is amplified.

The DNA fingerprint appears as distinct bands that are easy to read, store, and save on a computer until needed. The final results of genetic fingerprinting manifest as horizontal lines that vary in thickness and spacing, reflecting the unique genetic traits of each individual, making them easy to read, store, and retrieve for comparison.

DNA fingerprints have become strong evidence for exoneration or conviction, accepted in all courts in Europe and America for cases of murder, rape, sodomy, sexual crimes, theft, bombings, and terrorist acts. The perpetrator often leaves human remnants at the crime scene or on the victim's body in the form of bloodstains due to injury from violence or during an escape attempt, as well as semen, saliva on cigarette butts, cups, food remnants, or human hair and skin under the victim's or perpetrator's nails. This facilitates the discovery of thousands of unknown crimes and the reopening of investigations, with DNA fingerprints exonerating hundreds of individuals from murder and rape charges while convicting others and identifying their owners[12].

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[8]- Mohammed Mahmoud Al-Shanawy — "Genetic Fingerprinting Technology in Crime Detection" — Master's Thesis — Faculty of Law — Cairo University, 2009, p. 75.
[9]- Sami Hassan Al-Husseini — "The General Theory of Search in Comparative Egyptian Law" — Doctoral Thesis — Faculty of Law — Ain Shams University, 1970, p. 245.
[10]- Dr. Ahmed Mohammed Abu Al-Qasim— "Physical Evidence and Its Role in Proof in Islamic Jurisprudence" — Doctoral Thesis — Faculty of Law — Zagazig University, 1990, p. 257.
[11]- Dr. Ramzi Riyad Awad — "The Previous Reference," pp. 9-10.
[12]- Badr Khaled Al-Khalifa— "The Previous Reference," pp. 32-33.

Section Two: The Legitimacy of Evidence Derived from Genetic Fingerprinting Tests in Various Legislations

There is a near consensus among legal scholars that the primary justification for the principle of freedom of evidence is to protect the community's interest in combating crime. Achieving this is challenging if the means to prove a crime and attribute it to the perpetrator are absent[13].

However, this goal, which society strives for to uncover the truth of a crime and punish its perpetrator, must not, under any circumstances, overshadow the rights and freedoms of individuals. This necessitates the provision of sufficient guarantees to protect individual rights and freedoms in the pursuit of truth. Regardless of the advancements in scientific precision and speed in proving crimes, such as through genetic fingerprinting, the interests of society are not the only considerations; individual rights and freedoms must also be upheld[14].

The importance of the consent of those subjected to genetic fingerprint tests is paramount. When it involves procedures that infringe upon human bodily integrity, consent must be a central element. Therefore, can a suspect be subjected to procedures that violate their bodily integrity under the pretext of revealing the truth, even if such actions necessitate coercion and violence to obtain the necessary samples? Especially since the principle agreed upon by legal scholars is that any infringement on fundamental human rights only gains legitimacy in circumstances explicitly permitted by law[15]. Hence, we aim to highlight the stance of comparative criminal legislations regarding the legality of using genetic fingerprint tests, focusing on the perspectives of Western and Arab legislations.

Subsection One: The Stance of Western Legislations

The perspective of Western legislations on the legitimacy of this evidence varies. Some have established databases specifically for genetic fingerprints of offenders in certain crimes and have permitted the storage of these fingerprints, which we will examine in this subsection.

First Branch: The Position of the French Legislator

The new French Penal Code of 1996, in Articles 226, paragraphs 25 and 28, permits the use of genetic fingerprinting in specific cases, including: 1) medical purposes, 2) scientific research, and 3) within the framework of proper criminal procedures. Outside these cases, the French Penal Code criminalizes the misuse of this method, imposing a prison sentence of one year and a fine of 100,000 French francs. It also imposes the same penalty on anyone who discloses information related to identifying a person by their genetic fingerprints or who identifies someone through this means outside the specified framework without the approval mentioned in Article 156, paragraph 16 of the Public Health Code.

Thus, the French legislator has established the foundations and regulations for the use of genetic fingerprints, allowing this method to be utilized within the scope of proper criminal procedures at all stages, including before the judge[16].

It is important to note that before the amendment of the French Penal Code, the use of genetic fingerprinting for judicial applications in criminal matters was based on Article 60 of the French Code of Criminal Procedure, which allows for expedited searches in criminal investigations and Article 77, paragraph 01, which relates to preliminary investigations and initial inquiries.

[13]- Dr. Mamoun Salama — "Criminal Procedures in Egyptian Legislation" — Dar Al-Nahda Al-Arabiya — Part Two, pp. 251-252.
[14]- Dr. Hossam Al-Ahmad — "Genetic Fingerprinting — Its Admissibility in Criminal Evidence and Parentage" — Al-Halabi Legal Publications — Beirut — First Edition — 2010, p. 149.
[15]- Dr. Ashraf Tawfiq Shams Al-Din— "Genetic Genes and Criminal Protection of the Right to Privacy" — Dar Al-Nahda Al-Arabiya — No Edition — Year 2006, p. 113.
[16]- Dr. Mohammed Lotfi Abdel Fattah— "Criminal Law and the Uses of Modern Technology — A Comparative Study" — Dar Al-Fikr Wal-Qanun — First Edition — Year 2010, p. 236.

Additionally, Articles 81, 82, and 156 of the same law permit the judge to utilize expertise or adopt any means deemed useful for revealing the truth[17].

Following the amendment to the Penal Code issued on July 29, 1996, the use of genetic fingerprinting became regulated and is routinely applied in preliminary investigations[18].

A French judge, Gilbert Veil, who first used genetic fingerprints in the case of Simon Diéber in 1988, emphasized the need for caution when interpreting DNA analysis results. For example, finding saliva traces on a cigarette butt at a crime scene could provide investigators with leads, but this does not necessarily mean that the person who smoked the cigarette is the murderer. The French judge concludes that investigators should not neglect traditional investigative principles, asserting that the burden of proof should not be reduced to a simple investigation, even if it is based on genetic origins like genetic fingerprints[19]. This sentiment was echoed by biologists, police officers, and European judges who participated in a conference in Bordeaux, France, in 2000, titled "Ten Years of Genetic Fingerprints in Judicial Application," where they called for genetic fingerprints not to be regarded as the sole evidence in criminal cases. They emphasized that it is merely one element of the investigation, meaning that DNA testing should complement other traditional investigative methods and cannot replace them in any way. Furthermore, DNA test results can only be conclusive under specific conditions[20].

Second Branch: The position of the English legislator

Sections 62 and 63 of the Police and Criminal Evidence Act 1984 permit medical examinations of suspects to prove or disprove allegations, whether by physical tests or by special provisions relating to DNA analysis. Except for urine and saliva, samples can only be taken from suspects with their express written consent; if they refuse, they must be informed that this refusal will be considered as circumstantial evidence against them[21].

The first ruling in this area was made by the Bristol court in 1987 in a rape case where a person sexually assaulted a disabled woman. The authorities charged a man named Robert Males, and DNA analysis of traces found at the crime scene matched perfectly with samples taken from the suspect, leading to his conviction[22].

In 1993, the Royal Commission on Criminal Justice recommended expanding the use of genetic testing for identification purposes, a recommendation that was adopted by the English legislature in the Criminal Justice and Public Order Act of 1995. This act allows for DNA testing and the collection of samples from anyone convicted of a misdemeanor punishable by imprisonment.

In addition, the aforementioned law established a central database containing the genetic fingerprints of persons charged with misdemeanors punishable by imprisonment, as well as the results of genetic analyses of samples found at crime scenes whose owners are unknown. If the

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[17]- Dr. Mohammed Mahmoud Al-Shanawy — "The Previous Reference," p. 111.

[18]- N-J Mazen — "Tests and Genetic Fingerprints: From Legal Ambiguity to Scientific Authority" — LPA, 14.12.1994, Special Issue, p. 72.

[19]- Ten Years of Genetic Fingerprints under the direction of Christian Doutremepuich, La Documentation Française, Paris 2001 — "Genetic Fingerprints," Review Sciences et Avenir, No. 643, September 2000, p. 43.

- A. Giudicelli — "On the Purpose of Sampling and Analysis Regarding Genetic Fingerprints" — RSC 2001, p. 607.

[20]- Dr. Fawaz Saleh— "The Admissibility of Genetic Fingerprints in Criminal Cases — A Comparative Study" — Damascus University Journal for Economic and Legal Sciences, Volume 23, Issue 1, Year 2007, p. 295.

[21]- Dr. Mohammed Mahmoud Al-Shanawy — "The Previous Reference," p. 94.

[22]- Dr. Fouad Abdel Moneim— "Genetic Fingerprinting and Its Role in Criminal Evidence" — The Previous Reference, p. 1145.

accused is proven innocent, the samples must be destroyed and their genetic fingerprints removed from the automated records[23].

Since its establishment in 1995 until 2000, this database contained 817,450 genetic fingerprints of suspects, allowing for the resolution of 88,595 crimes through matching genetic fingerprints, including 77,522 matches between suspects and unknown traces, and 11,073 matches between two pieces of evidence found at the crime scene.

Accessing this automated record from 1995 to 2000 helped solve 2,660 murder cases, 400 rape cases, and 2,500 burglary cases[24].

Third Branch: The Position of the United States of America

Genetic fingerprinting was first used in the United States in 1986 in a case before a Pennsylvania court. Since then, the use of this technique has rapidly increased. Conversely, the value of DNA testing in evidence has been highlighted by the methodology, precision, and rigor required for testing procedures, exemplified by the Castro case in 1989. In this case, blood found on the suspect Castro's watch was tested, and the results indicated that the extracted genetic fingerprint matched that of one of the victims. However, the defense attorney requested a counter-expertise conducted by internationally recognized experts in the field, who demonstrated that the match between the two fingerprints could not be conclusively established.

This case prompted American authorities to establish quality standards to prevent such incidents. There was also a recognized need for a reliable system to collect genetic fingerprints of convicted criminals and those obtained from crime scene analyses where the identities of the perpetrators are unknown, facilitating information exchange at local, state, and federal levels and coordinating investigations among police departments.

The American legislator established these rules through the DNA Identification Act of 1994, which authorized the FBI to create secure databases for storing genetic fingerprints of felony and misdemeanor offenders, as well as genetic fingerprints from biological evidence found at crime scenes and those obtained from unidentified human remains in cases of natural disasters or major fires[25].

Additionally, each U.S. state has established databases specifically for the genetic fingerprints of sex offenders, and some states have permitted the storage of genetic fingerprint results from sex offenders, creating automated records supported by an information system at the federal level to coordinate the data and information across state records[26].

Subsection One: The Position of Arab Legislations

Arab legislations have differing views on genetic fingerprinting. Some have given it a prominent place in practical application, while others consider it unsuitable as an independent means of proof, allowing its use only under specific conditions and regulations. This will be examined in this subsection.

First Branch: The Position of the Algerian Legislator

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[23]- Paul Gauchan and Petre D. Martin— "DNA Databases in Great Britain," in "Genetic Fingerprints in Judicial Practice," under the direction of Christine Doutremepuich, La Documentation Française, Paris, 1998, p. 137.

[24]- M. Christian CABAL— "The Scientific Value of Using Genetic Fingerprints in the Judicial Field," Report presented to the Senate No. 364 and the National Assembly No. 3121 on June 7, 2001, p. 31.

[25]- See Manon LAPOINTE— "Identification by Genetic Analysis in the Canadian Criminal Proof System: Seeking the Difficult Balance between Truth and the Fundamental Rights of the Accused" in "Genetic Analysis for Evidence Purposes and Human Rights," under the direction of Christine Hennau-Hublet and Bartha Maria Knoppers, Bruylant, Brussels, 1997, p. 227.

[26]- Dr. Ibrahim Sadiq Al-Jundi— "Forensic Medicine in Criminal Investigations" — Research and Studies Center at Naif Arab University for Security Sciences — Riyadh 2000, p. 231.

There is no doubt that genetic fingerprinting has revolutionized investigative methods in criminal cases. However, the evidence derived from it remains subject to the principle of freedom of evidence, like other forms of evidence, and does not occupy a superior position. This may explain why the Algerian legislator has refrained from addressing it in recent amendments to the Code of Criminal Procedure, despite acknowledging the potential use of some modern scientific methods for investigating serious crimes.

Nonetheless, it can be said that the Algerian legislator implicitly refers to the possibility of using DNA testing, as inferred from Article 68 of the Algerian Code of Criminal Procedure, which allows the investigating judge to order medical examinations or any other measures they deem useful. This is further supported by the general criminal policy in Algeria, which established the National Genetic Fingerprint Laboratory on July 20, 2004, under the Scientific and Technical Laboratory of the Judicial Police. This laboratory is the first of its kind in the Arab world and the second in Africa. Its establishment took into account all international standards that most international forensic laboratories meet. Following this, the Criminal Evidence Institute was established under the National Gendarmerie, staffed with a team of experts and specialized doctors and technicians in genetic fingerprinting and various modern scientific fields that assist in solving complex criminal cases[27].

However, the Algerian legislator has not provided any specific procedural texts for this means of proof, leaving it to the general rule of freedom of criminal evidence. This is considered by researchers to be a legislative shortcoming, given the challenges posed by this scientific method, which requires clear regulations for its use to avoid it being subject to the discretion of police officers.

With the advancements in biotechnology, the Algerian legislator, through Law 16-03 concerning genetic fingerprinting, acknowledges it as a modern means of criminal proof characterized by conclusive evidence and confirmed probative value. However, it does not prioritize it over other forms of evidence[28].

Second Branch: The Position of the Egyptian Legislator

Like the Algerian legislator, the Egyptian legislator has not specifically addressed genetic fingerprinting. However, it appears to benefit from the provisions of Article 85 of the Code of Criminal Procedure concerning genetic fingerprinting, classifying it as part of medical expertise, which the investigating judge may resort to via an order specifying the types of investigations and what is to be proven.

It is evident that the Egyptian legislator refers scientific advancements in genetics to experts and seeks their opinions regarding medical, technological, and other scientific matters, but has not explicitly enacted any law regulating the use of genetic fingerprinting by experts.

However, Egyptian legal scholars continue to debate whether genetic fingerprinting should be considered circumstantial evidence in criminal matters. On this basis, opinions diverge on its potential as a basis for judgment. The first viewpoint asserts that genetic fingerprinting is not suitable as an independent means of proof and does not provide conclusive evidence; rather, it is merely a supporting factor in investigations to discover the crime and induce confessions from the accused. Proponents of this view consider genetic fingerprinting to be a simple circumstantial evidence that lacks definitive probative force, as science, no matter how advanced, remains relative. Since it relies on the opinions of technicians and experts, the possibility of error exists,

[27]- Bzou Fatima— "Scientific Police and Their Role in Proving Crime" — Final Study Memo for Obtaining a Degree from the Higher School for Judges — Batch 16 — 2007-2008, p. 8.
[28]- Mohammed Al-Saeed Zanati— "Genetic Fingerprinting and Its Role in the Personal Conviction of the Criminal Judge in Algerian Law" — Doctoral Thesis, L.M.D., University of Batna, Algeria, DSPACE, p. 1.

whether intentional or unintentional, and therefore, a judge's discretion should not be constrained by such evidence[29].

The second opinion does not regard genetic fingerprinting as an act of technical expertise in the strict sense, as it does not represent the opinion of a technician examining a fact of importance in the criminal case. Instead, it is seen as a direct application of the laws presumed by expertise to extract proof of the fact. Scientifically, genetic fingerprinting is nearly infallible in verifying identity and is thus considered conclusive evidence. Proponents of this view advocate for the acceptance of genetic fingerprinting as a means of proof, asserting that legislative authority should enact laws regarding its usage.

The third opinion emphasizes the necessity of accepting genetic fingerprinting as evidence for exoneration or conviction in court. Advocates of this view argue that there is no objection to leveraging scientific knowledge in the service of judicial rulings, provided that conditions and regulations ensure the integrity of tests and the samples collected from crime scenes. They assert that genetic fingerprinting does not rely on the expertise of the examining technician but rather on established scientific principles, thus qualifying as conclusive evidence that judges should consider and adhere to.[30]

The Egyptian Court of Cassation has ruled in favor of accepting evidence derived from genetic fingerprinting as circumstantial evidence, stating in one case related to genetic fingerprinting that matching fingerprints constitute material evidence with significant probative value based on scientific and technical foundations. The potential for incomplete matching between the fingerprints of different individuals does not undermine this value. Thus, it can be concluded that despite the absence of explicit provisions in Egyptian law regarding genetic fingerprint testing as a means of proof, the spirit of Egyptian law does not reject the acceptance of genetic fingerprinting techniques, provided certain conditions are met that assure the judiciary of the reliability of this evidence in serving justice[31].

CONCLUSION:

From the above, we understand that scientific evidence is based on principles and scientific facts that were unknown in previous eras. It has begun to occupy its rightful place in the field of criminal evidence, given its elements of strength and its characteristics of stability, reliability and trust in its scientific sources.

As a result of the evolution of criminal phenomena and the use of modern technology in carrying out serious criminal operations, which has complicated the task of law enforcement officers in searching for and collecting evidence, it has become essential for judicial officers to keep pace with this development by using modern scientific methods that help to achieve their purpose and secure evidence leading to the conviction of the accused. The use of these scientific methods, including genetic fingerprinting, which has been considered differently by different legislations, has arguably become the only means for the police to combat the phenomenon of impunity due to the lack of evidence of the commission of a crime.

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[29]- Dr. Mohammed Mahmoud Al-Shanawy — "Genetic Fingerprinting Technology in Crime Detection" — The Previous Reference, p. 84.

[30]- Dr. Ahmed Youssef Al-Sayoola — "Genetic Fingerprinting and Its Admissibility in Criminal Evidence," Police Academy — Issue Eighteen — January 2008, p. 289.

-See also: Dr. Abu Al-Wafa Mohammed Abu Al-Wafa — "The Extent of the Admissibility of Genetic Fingerprinting" — Research presented at the Conference on Genetic Engineering between Sharia and Law in the United Arab Emirates — From May 5-7, 2002 — Published in the Journal of Sharia and Law, Year 2002, p. 401.

-Also: Dr. Ahmed Habib Al-Samak — "The System of Proof in Islamic Sharia and Positive Law" — Published in the Journal of Law — Scientific Publishing Council in Kuwait — Eleventh Year — Issue Two — June 1997, p. 151.

[31]- Dr. Ahmed Youssef Al-Sayoola— "The Previous Reference," p. 290.

Despite the efforts that have been and continue to be made, these challenges often remain difficult and intractable in the absence of a clear strategy to deal with this category of crimes and their perpetrators, particularly in countries that have yet to amend their legislation to overcome traditional legal frameworks that no longer fit this era.

On the basis of the above, we conclude with a series of results that can be summarized as follows:

- The principle of the legitimacy of evidence in criminal evidence is a limit that a criminal judge cannot exceed. Given the specificity of criminal law based on the principle of freedom of evidence and the right of the accused to reinforce the presumption of innocence, the judge's freedom to be convinced by the evidence presented must be limited by the requirement of the validity and legality of the evidence from a procedural perspective, as well as its conformity with the principles of justice.

- The application of the principle of the legitimacy of evidence in criminal evidence is more evident in the adoption of the rule of exclusion of evidence illegally obtained in the personal conviction of the judge.

- Modern scientific methods have established their presence in the field, possessing probative power that assures legislators and allows them to rely on these methods to face the greatest challenge of law: proof. Despite criticism of some of these methods, they continue to dominate the evidentiary process compared to other traditional forms of evidence, with genetic fingerprinting being a prime example.

- Allowing law enforcement officials broad freedom to use modern scientific methods such as genetic fingerprinting in criminal evidence without any restrictions or regulations can open the door to potential abuses in the use of this method.

- There is a clear shortcoming in many Arab procedural criminal laws, as evidenced by the delay in keeping pace with Western legislation in dealing with modern criminal phenomena.

RECOMMENDATIONS:

- It is essential to explicitly state that the use of these scientific methods in evidence must be subject to judicial oversight and control to confer credibility on these procedures, ensuring they are not merely a tool for law enforcement officers to use at their convenience or to disregard when they see fit.

- Efforts should be made to incorporate specific courses on information security into the curricula of police and gendarmerie academies, as well as the Higher School for Judges, to familiarize them with cyber crimes and how to address them.

- The researcher recommends archiving the cases of criminals and those with serious criminal records by establishing a dedicated database for storing DNA analysis data and results, similar to modern legislations. This database should be under the authority and management of the Ministry of Justice, supervised by specialized personnel at the rank of judge to ensure necessary protection, credibility, and neutrality.

- There should be an establishment of a specialized prosecutor's office focused on cyber crimes, similar to those in developed countries.

- Arab countries are encouraged to conclude more agreements among themselves, akin to European agreements, to enhance judicial and police cooperation and information exchange in order to address the procedural challenges arising from transnational cyber crimes, serious criminal networks, and criminal organizations.

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