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The role of DNA evidence in criminal proceedings

by

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RK Moletsane

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“For I know the plans I have for you, declares the Lord, plans to prosper you and not to harm you, plans to give you hope and a future.”

-Jeremiah 29:11

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I am a child of God and the product of my ancestors and one day, I’m going to have everything I prayed for, this is just the beginning.

Abstract

The use of forensic evidence has been utilised in our criminal justice system for decades and has continued to develop immensely over the years. Technological advancements regarding DNA profiling techniques, such as the Restriction Fragment Length Polymorphism (RFLP) and the Short Tandem Repeat analysis (STR), have made it possible for DNA testing to become more accurate. DNA evidence can be used for multiple reasons such as the identification of the perpetrator and the extent to which they were involved in the crime. This dissertation seeks to understand the role of DNA evidence in criminal proceedings as well as the admissibility requirements of DNA evidence by comparing two jurisdictions, namely, South Africa and the United States of America. DNA evidence undoubtedly plays a massive role in our criminal justice system; however, it is not a perfect system without error as several problems could arise during the collection, testing or using of DNA evidence. Although there are several legislative provisions that have been established regarding the use of DNA evidence, factors such as the contamination of samples, mislabelling of samples, improper preparation of laboratory results and inadequately qualified field workers pose a threat to the quality of DNA evidence that is produced and handed to legal representatives to use in court and build their case. These problems often lead to miscarriages of justice which negatively impede the growth of our justice system as well as the rights of the accused to a fair trial. In addition, these issues raise questions concerning the reliability of DNA evidence and whether convictions based solely on DNA evidence are justifiable.

Keywords:

DNA evidence, scientific evidence, samples, DNA profiling, admissibility, relevance, chain of custody, pre-trial disclosure, Federal Rules of Evidence, Federal Rules of Criminal Procedure, Criminal Procedure Act, criminal justice system.

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CHAPTER 1: INTRODUCTION

1.1 Introduction

The law of evidence plays a very vital role in our justice system including the criminal justice system and will always be utilised as a fundamental component in proving an accused's innocence or guilt. There are several categories in which evidence can be classified, these categories include documentary evidence, real evidence, oral evidence and electronic evidence.[1] For the purposes of this study, the focus area will be on real evidence, particularly deoxyribonucleic acid evidence (hereinafter referred to as DNA evidence). This particular form of evidence has been utilised in our justice system as well as in other jurisdictions for a very long time and can be recovered from multiple sources such as hair, saliva, blood and teeth.[2] As a result, certain techniques for DNA testing have evolved over time due to biological sciences.[3] Therefore, it is essential for legal practitioners, presiding officers and forensic experts to stay updated and aware of the latest developments concerning DNA evidence.[4]

DNA evidence in criminal cases is often used in crimes such as sexual assault, theft, housebreaking, robbery and murder.[5] Forensic DNA testing has multiple uses and can aid in determining several things, such as the identity of the perpetrator and that of the victim, determining the extent to which the accused was involved in the crime, as well as the common involvement of one individual in separate crimes.[6] DNA testing/evidence has proven to be very useful in our law, however, there are several problems that could arise when collecting, testing or using DNA evidence. For instance, when collecting DNA samples, there could be a mislabelling of samples, contamination, the use of non-sterile tools as well as poor training of forensic field workers.[7] Before any evidence can be presented within a court of law, it is important to first prove that the particular set of evidence has been kept in a safe place, that it

[1] See in general DT Zeffertt & AP Paizes *Essential evidence* (2020) chapters 21-22; A Bellengère & Others *The law of Evidence in South Africa* (2019) chapters 10-14 and CWH Schmidt *Law of Evidence* (2022) chapters 9-13.
[2] L Meintjes-Van der Walt 'An overview of the use of DNA evidence in South African Criminal Courts' (2008) 21(1) *South African Journal of Criminal Justice* at 24.
[3] L Meintjes-Van der Walt *DNA in the courtroom: principles and practices* (2010) at 117.
[4] Meintjes-Van der Walt (n2) at 22.
[5] Meintjes-Van der Walt (n3) at 1.
[6] Meintjes-Van der Walt (n2) at 23.
[7] Meintjes-Van der Walt (n3) at 13.

has not been tampered with and that it has not been contaminated.[8] For DNA evidence to be used to the best of its ability and for it to contribute positively towards our criminal justice system, it is important to be aware of and understand the multiple issues that could arise when dealing with DNA evidence.

1.2 Motivation

The motivation behind this study lies within the problems that the justice system is faced with regarding DNA evidence. The law of evidence in its entirety plays a massive role in ensuring access to justice and can be regarded as one of the most fundamental building blocks in criminal cases. The Constitution of the Republic of South Africa, 1996 (hereinafter referred to as the Constitution) states that everyone has the right to a fair trial which includes equality before the law as well as an effective and constructive remedy before the law.[9] In order to ensure an accused's right to a fair trial, the Constitution also affords an accused the right to legal representation.[10] Legal representation is necessary for effective access to justice and our law considers access to legal representation to be a corollary of the right of access to the courts themselves.[11] It is therefore imperative for legal practitioners to stay abreast of the recent developments in the field of DNA evidence and the technological and biological advances that make such development possible for them to provide adequate and effective legal representation.[12] One thing that has become apparent during the research, is that there are a considerable amount of misconceptions and uncertainty regarding DNA evidence within the legal field.[13] This study will aid in addressing issues that are not always visible within the law of evidence such as contamination of specimens, mislabelling of evidence, the processing and collection of crime samples and competent legal representation. In addition, the study aims to provide possible recommendations to address the various issues regarding DNA evidence and the manner in which DNA evidence is handled in criminal proceedings.

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[8] Meintjes-Van der Walt (n3) at 14.
[9] The Constitution of the Republic of South Africa, 1996 sec 35(3).
[10] The Constitution of the Republic of South Africa, 1996 sec 35(3).
[11] PM Bekker 'The right to legal representation including effective assistance for an accused in the criminal justice system of South Africa' (2004) 37 *The Comparative and International Law Journal of Southern Africa* at 174. RK Moletsane 'Access to justice: The right to adequate legal representation in criminal proceedings' LLB thesis, University of the Free State (2021) at 4.
[12] S de Wet & others 'DNA profiling and the law in South Africa' (2011) 14 *Potchefstroom Electronic Law Journal* at 1.
[13] De Wet (n12) at 1. Also see Meintjes-Van der Walt (n2) at 24.

1.3 Problem statement and research question

There is no doubt that forensic DNA evidence has revolutionised our criminal justice system, however, it is not a perfect system that is flawless and immune to error.[14] These errors can lead to several miscarriages within our justice system.

The aim of the study is to critically analyse the functions and the role of DNA evidence in our criminal justice system, the manner in which DNA evidence is handled in criminal proceedings as well as the shortcomings of DNA evidence. This study will focus on answering the following questions:

a) To what extent is DNA evidence utilised in criminal proceedings in South Africa and the United States of America?
b) How is the reliability of DNA evidence determined?
c) What role does DNA evidence play in wrongful convictions?
d) Should convictions be solely based on DNA evidence?

1.4 Brief overview of the research framework

Before DNA may be used in court as evidence to determine whether the perpetrator committed the offence, the evidence must first be admissible in a court of law. For evidence to be admissible, it must comply with certain rules. One of the rules relating to the admissibility of evidence is that the evidence must be relevant to an issue in the proceedings.[15] In the United States of America (hereinafter referred to as the USA), after the courts reach the conclusion that the evidence is relevant to the case, there are two ways in which the admissibility of evidence can be determined; namely the Frye standard or the Daubert standard.[16] The Daubert standard has become essential in all Federal Courts and must be used to determine the admissibility of evidence in all Federal Courts.[17] In addition to the rules of admissibility, one ought to take into consideration the exclusionary rules pertaining to DNA evidence. Even though DNA

[14] N Elster 'How forensic DNA evidence can lead to wrongful convictions' 06 December 2017 https://daily.jstor.org/forensic-dna-evidence-can-lead-wrongful-convictions/ (accessed on 30 March 2022).
[15] Criminal Procedure Act 51 of 1977 s210. See also in general Bellengère (n1) at 54.
[16] NR Behrouzfard 'Strengths, limitations and controversies of DNA evidence' (2006) 1 *Southern New England Roundtable Symposium Law Journal* at 110.
[17] LR Fournier 'The Daubert guidelines: usefulness, utilization and suggestions for improving quality control' (2016) 5 *Journal of Applied Research in Memory and Cognition* at 309.

evidence might be found to be relevant to the case in question, such DNA evidence may still be prohibited.[18]

There have been several DNA profiling techniques that have been developed throughout the years.[19] As technology advances, these DNA profiling techniques improve, making it easier to extract DNA from small or degraded samples.[20] Although there are several DNA profiling techniques and rules regarding the admissibility of forensic evidence in criminal proceedings, there are several issues that can occur regarding DNA evidence. These issues include but are not limited to; contamination, degradation of samples, laboratory errors, unlawful sample collection and inadequately qualified examiners.[21] These issues may take place at any stage of the process. This is why it is imperative that the integrity of the DNA sample is maintained at all times and that a strict chain of custody is followed in order to minimise some of these issues.[22]

In *S v Maqhina*, the prosecution had built its case against the accused solely on the outcomes of the DNA results, however, during the case, the court noted several issues relating to the results of the DNA evidence in question.[23] This case was yet another example that DNA evidence alone, should not be the sole reason for an individual's conviction. It is always advisable that the courts make verdicts based on other evidence in support of DNA evidence. These are the common causes of miscarriages of justice, together with inadequate legal representation which often at times leads to wrongful convictions and therefore, impedes an accused's right to adequate legal representation. The principle of effective legal counsel is also applicable in the USA. In *Driscoll v Dello*, the court held that the accused did not receive effective and competent legal representation as the legal counsel failed to adequately prepare for the introduction of blood identification evidence and failed to adequately cross-examine the state expert regarding the important issue of the blood testing

[18] Bellengère (n1) at 54.
[19] P Gill 'Misleading DNA evidence: Reasons for miscarriages of justice' (2012) 10 *International Commentary of Evidence* at 56.
[20] E Murphy 'The art in the science of DNA: A laypersons guide to the subjectivity inherent in forensic DNA typing' (2008) 58(2) *Emory Law Journal* at 490.
[21] L Meintjies-Van der Walt 'The proof of the pudding: The presentation and proof of expert evidence in South Africa' (2003) 47 *Journal of African Law* at 93.
[22] A Holobinko 'Forensic human identification in the United States and Canada: A review of the law, admissible techniques and the legal implications of their application in forensic cases' (2012) 222 *Forensic Science International* at 394.e2.
[23] *S v Maqhina* 2001 (1) SACR 241 (T).

methodology that was used.[24] The absence of appropriate, competent, and effective legal representation can have life-altering repercussions and can result in denials of our most basic human rights.[25]

1.5 Methodology

This study will make use of a multi-layered approach consisting of desktop research. It will make use of a theoretical approach which will analyse the regulatory framework that governs DNA evidence. This will include using both primary sources (legislation, case law and federal rules) and secondary sources (journal articles and books) to formulate the arguments. This is a comparative study and will therefore include sources from the USA, more specifically Federal law. The motivation behind using Federal law stems from the fact that an analysis of expert evidence (which is vital regarding DNA evidence in the USA) is not entirely complete without looking at the *Frye* and *Daubert* cases which are Federal cases.

The reason for a comparative study with the chosen jurisdiction is to compare, engage and assess the views of both the South African and the American position with regard to DNA evidence in criminal proceedings. This particular jurisdiction has been chosen as it shares many similarities with the South African system that will be useful in this study. Both South Africa and the USA are members of the Anglo-American law of evidence family. These countries' legal systems have the same legal historical heritage in that their evidentiary standards and procedures may be traced back to the English common law. Furthermore, both jurisdictions are adversarial in nature.

1.6 Limitation of the study

This research will not address the medical science involved in DNA testing but will only provide a brief overview to contextualise the study. Furthermore, this study will not address post-conviction DNA testing/ evidence. In addition, possible solutions will be provided based solely on the research, however, the dissertation does not purport to include all the possible solutions. Further research needs to be conducted surrounding the possible recommendations which go beyond the scope of this study.

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[24] *Driscoll v Dello* 71 F.3d 701 Cir 1995.

[25] H Lintz and others 'A basic human right: meaningful access to legal representation' June 2015 https://law.unc.edu/wp-content/uploads/2019/10/malr.pdf (accessed on 29 May 2022) at 7. Moletsane (n11) at 24.

1.7 Structure of chapters

The study is structured as follows:

Chapter 1 introduced the topic and provided the research statement, research questions and the method that is to be followed. In addition, it also contained a summary of the study as well as the limitations of the study.

Chapter 2 aims to look at the South African legal system, the identification and admissibility rules of DNA evidence, the chain of custody, the pre-trial disclosure of DNA evidence as well as the evaluation of DNA evidence in court proceedings.

Chapter 3 is the comparative chapter, and it aims to look at the legal system of the United States of America as well as the different admissibility rules that are used in that jurisdiction in order to regulate the use of DNA evidence in criminal proceedings. Moreover, chapter 3 will look at the chain of evidence, pre-trial disclosure of DNA evidence in the United States as well as the evaluation of DNA evidence in court proceedings.

Chapter 4 aims to analyse the various DNA profiling techniques that exist and how these techniques influence the results of DNA testing. Furthermore, this chapter will look at the various shortcoming of DNA evidence, the effect of competent legal representation regarding DNA evidence and whether a conviction based solely on DNA evidence should be permitted considering all the various errors that can occur regarding DNA evidence.

Chapter 5 will be the concluding chapter which will contain an analysis of the research findings and it will also contain conclusions that have been drawn from the research as well as some recommendations on how to improve the use of DNA evidence in criminal proceedings.

1.8 Conclusion

It is evident that there are still a few underlying issues that need to be ironed out regarding DNA evidence and DNA testing in both legal systems. Although DNA testing is regarded as of high value in our justice system, its problems concerning reliability and fairness do leave a dent in our justice system.[26] So many individuals have been

[26] Behrouzfard (n16) at 112.

denied justice due to faulty DNA testing and so many still remain behind bars due to the lack of sufficient and effective DNA testing.[27] At times it can be unfair to rely entirely on DNA evidence in order to convict an accused.[28] In some cases, it is sometimes difficult to establish that an accused is the actual criminal in the absence of any other evidence, especially in cold hit cases and thus relying entirely on DNA evidence may result in the miscarriage of justice in the form of wrongful convictions.[29] However, unlike in the USA, in South Africa, a conviction based solely on DNA evidence is not prohibited.[30] Case law has indicated that if the evidence is relevant, admissible and reliable in the circumstances of the case, a court can condemn an accused solely on the basis of DNA evidence.[31] However, in agreement with Meintjes and Dhliwayo, this study argues that this method remains risky and should be limited at all costs as DNA evidence is not immune to errors.[32]

[27] Behrouzfard (n16) at 112.
[28] L Meintjes-Van der Walt & P Dhliwayo 'DNA evidence as the basis for conviction' (2021) 24 *Potchefstroom Electronic Law Journal* at 24.
[29] Meintjes-Van der Walt & Dhliwayo (n28) at 24.
[30] Meintjes-Van der Walt & Dhliwayo (n28) at 26.
[31] Meintjes-Van der Walt & Dhliwayo (n28) at 26.
[32] Meintjes-Van der Walt & Dhliwayo (n28) at 27.

CHAPTER 2: EVIDENTIARY RULES OF DNA EVIDENCE IN SOUTH AFRICA

2.1 Introduction

Scientific evidence such as DNA evidence plays a vital role in our criminal justice system.[1] DNA evidence is classified as real evidence; however, it is also categorised as circumstantial evidence since the court has to draw inferences from it.[2]

DNA profiling has several advantages pertaining to criminal investigations.[3] It can be used to corroborate the victim's testimony, it can be more reliable than eyewitnesses and it can further assist in linking certain items containing genetic material related to the crime scene or previous crimes.[4] It is important to note that before any evidence can be presented in court, it is important to prove that the particular piece of evidence has been kept in a safe place, that it has not been tampered with and that it has not been contaminated.[5] Therefore, it is of paramount importance that the pre-trial investigation procedures are carried out accurately and with the utmost care. The admissibility and relevancy of DNA evidence depend heavily on this.[6] Once DNA evidence has been collected, transferred and analysed by forensic scientists, the question becomes: how can this DNA be used as evidence in court? Before evidence can be admitted in court it must comply with certain rules of admissibility. These rules of admissibility are determined by the common law and relevant sections of the Criminal Procedure Act,[7] which must be consistent with the Constitution of the Republic of South Africa.[8]

The aim of this chapter is to briefly look at the legal system of South Africa and evaluate the evidentiary rules of DNA evidence. Furthermore, it will focus on the pre-

[1] L Meintjes-Van der Walt 'An overview of the use of DNA evidence in South African Criminal Courts' (2008) 21 (1) *South African Journal of Criminal Justice* at 23.
[2] DT Zeffertt & AP Paizes *Essential Evidence* (2020) at 23. See also *Komane v S* [2022] JOL 52949 (SCA) where the court had to determine whether circumstantial evidence consisting of DNA evidence, amongst others, was sufficient to convict the appellant.
[3] Section 36A (fD) of the Criminal Procedure Act defines a forensic DNA profile as the results obtained from a forensic DNA analysis of bodily samples taken from a person or samples taken from a crime scene, providing a unique string of alpha numeric characters to provide identity reference: provided this does not contain any information of the health or medical condition or mental characteristics of a person or the predisposition or physical information of the person other than the sex of that person.
[4] L Meintjes-Van der Walt *DNA in the courtroom: Principles and practices* (2010) at 2.
[5] Meintjes-Van der Walt (n1) at 14.
[6] Meintjes-Van der Walt (n4) at 131.
[7] Criminal Procedure Act 51 of 1977.
[8] The Constitution of the Republic of South Africa, 1996.

trial stages of discovery, the chain of evidence as well as the evaluation of DNA evidence in criminal proceedings.

2.2 Short overview of the South African legal system

A comparative study can only be done successfully if there is a basic understanding of the different legal systems followed by each jurisdiction, therefore, in order to fully understand the evidentiary standards and procedures of the law of evidence in South Africa, it is important to look at the South African legal system. There are three systems, namely, the customary system, and the two colonially introduced systems being the adversarial and the inquisitorial system.[9] The process and procedures of these systems differ; however, they are all aimed at resolving disputes and are driven by the desire to uncover the truth.[10] The inquisitorial system is mostly based on "crime control", whereas the adversarial system is based on "due process".[11] The inquisitorial system is based on crime control where an accused was simply "the object of the inquiry".[12] Under this legal system, the accused does not participate in the proceedings, nor do they have any procedural rights.[13] This legal system was designed in such a manner that the main purpose and aim was to uphold the interests of society and that of the state.[14] On contrary, the accusatorial system can be said to be based on due process as it was developed on the foundation of finding the truth while taking into consideration and protecting the rights of the accused and enabling the accused to participate in the proceedings.[15]

Due to the historical developments that occurred in the Cape during the nineteenth century, South Africa's legal system is of a hybrid nature.[16] This system comprises of common law (Roman-Dutch law), customary law and English law, where the English law influence is mostly present in our procedural law as well as the adversary nature

[9] A Bellengère & others *The Law of Evidence in South Africa* (2019) at 11.
[10] Bellengère (n9) at 10.The truth in this instance refers to the formal truth, in other words what the courts determine "probably happened". See Bellengère (n9) at 62.
[11] C Roodt 'A historical perspective on the accusatory and inquisitorial system' (2004) 10 *Fundamina* at 137.
[12] CR Snyman 'The accusatorial and inquisitorial approaches to criminal procedure: some points of comparison between South Africa and Continental systems' (1975) 8(1) *Comparative and International Law Journal of Southern Africa* at 102.
[13] Snyman (n12) at 102. See also PJ Schwikkard & SE Van der Merwe *Principles of Evidence* (2016) at 12.
[14] Snyman (n12) at 102.
[15] Snyman (n12) at 102; Schiwkkard & Van der Merwe (n13) at 11-12.
[16] W Le R De Vos 'Illegally or unconstitutionally obtained evidence: A South African perspective' (2011) 2011(2) *Journal of South African Law* at 268.

of our trials.[17] Due to the influence of English law, South Africa's procedural system is primarily adversarial in nature; however, it is not adversarial in its entirety as it contains a few elements from the inquisitorial system.[18] It is extremely rare that one would find a civilised country that follows a legal system which is strictly adversarial in nature or a legal system that is strictly inquisitorial in nature.[19] An example of an inquisitorial feature in the South African legal system would be the sentencing procedure where the presiding officer takes charge in order to determine the best possible and suitable sentence while taking into consideration all the relevant factors and evidence that have been presented in court.[20] Despite the mixture of the two systems, South Africa follows a more accusatorial system.

The main difference between the adversarial and inquisitorial systems is that the adversarial system is aimed at finding or discovering the truth by putting the parties against each other, while the parties adduce evidence that is sufficient to prove their case.[21] The inquisitorial system on the other hand is aimed at discovering the truth by placing the fact-finding and decision-making on an experienced judge, therefore, there is no party control.[22] Several rules exist concerning the evidentiary inclusion of evidence under the adversarial system.[23] These rules include the admissibility of evidence at the beginning of the trial which is decided by the presiding officer, the weight of the evidence as well as the cogency of the evidence.[24] The purpose of these evidentiary rules is to provide reasonable access to justice and to fulfil the accused's right to a fair trial.[25]

The adversarial system is based on three features. Firstly, the parties are responsible for their own presentation of evidence that can be used to support their case.[26]

[17] Roodt (n11) at 151-152. Also see Zeffertt & Paizes (n2) at 3-5.
[18] Bellengère (n9) at 13.
[19] Snyman (n12) at 101.
[20] N Steytler 'Making South African criminal procedure more inquisitorial' (2001) 5(1) *Law, Democracy and Development* at 9.
[21] Bellengère (n9) at 11 and Steytler (n20) at 2.
[22] Bellengère (n9) at 11 and Steytler (n20) at 2.
[23] Bellengère (n9) at 11.
[24] Bellengère (n9) at 11.
[25] Bellengère (n9) at 13.
[26] Schwikkard & Van der Merwe (n13) at 11.

Secondly, the judge has to play a passive role.[27] Lastly, a lot of emphasis is put on the oral presentation of evidence, including the cross-examination of a witness.[28]

Although this system might seem ideal, it is not a perfect system without flaws or criticism. One of the issues with this system is that the parties might manipulate the facts or the truth to succeed in their case as the judge mostly relies on what the parties have said in order to make his or her decision.[29] Therefore, it is argued that for that reason it cannot be said that the presiding officer's ruling reflects the material truth, but it is rather a reflection of the formal truth.[30] Furthermore, if an accused is poorly represented due to inexperienced and/or incompetent legal counsel, this could have dire consequences on the fact-finding process, administration of justice and the accused's right to a fair trial.[31] Ultimately, this is why evidentiary rules of evidence and specific rules pertaining to the admissibility of evidence exist and must be scrutinised.

2.3 Admissibility of DNA evidence

2.3.1 Introduction

The Criminal Procedure Act defines deoxyribonucleic (DNA) as an "acid which is a bio-chemical molecule found in the cells and that makes each species unique".[32] DNA is the genetic material that is passed down from the parents to the child and these DNA molecules are found in the nucleus of the human cells which are the same throughout the entire human body.[33] DNA is made up of a double-stranded molecule that is made up of 46 sections which are known as chromosomes.[34] These chromosomes are divided into 23 pairs and carry the genetic material of each individual that is arranged in a linear sequence.[35] Every individual's DNA is unique, except for identical twins.[36] Identical twins will have the same DNA profile whereas every other individual will share approximately 95-99 per cent of their nucleotide

[27] Schwikkard & Van der Merwe (n13) at 11.
[28] Schwikkard & Van der Merwe (n13) at 11.
[29] Snyman (n12) at 108.
[30] Snyman (n12) at 108.
[31] Steytler (n20) at 3-4.
[32] Criminal Procedure Act 51 of 1977 sec 36A(fB).
[33] L Meintjes-Van der Walt & P Dhliwayo 'DNA evidence as the basis for a conviction' (2021) 24 *Potchefstroom Electronic Law Journal* at 2.
[34] Meintjes-Van der Walt & Dhliwayo (n33) at 2.
[35] Meintjes-Van der Walt & Dhliwayo (n33) at 2.
[36] Meintjes-Van der Walt & Dhliwayo (n33) at 2.

sequences.[37] These shared nucleotides create human characteristics that are common in all human beings such as having two eyes and a nose.[38] A person's DNA may be recovered from small pieces of evidence such as chewing gum, a drop of blood or saliva, fingerprints or a strand of hair.[39] DNA testing remains highly beneficial in criminal proceedings, especially for identification purposes as DNA profiles vary extensively amongst people.[40]

2.3.2 Classifying DNA evidence

To understand the rules of admissibility regarding DNA evidence, it is important to understand what category of evidence DNA evidence is classified as. DNA evidence is classified as real evidence which was defined in *S v M* as "any object which upon proper identification, becomes real evidence itself".[41]

In general, in the absence of an opponent's formal admission, the party wishing to provide real evidence for the courts' review, must summon a witness who can identify the real evidence, which may also include an expert witness in this instance.[42] The general rule in South African law is that opinion evidence is excluded and is not admissible in court.[43] A witness may only testify to what they have witnessed with either one of their five senses.[44] However, if the witness is an expert, then the opinion of the expert will be admissible provided that it is relevant to the proceedings.[45] In addition to relevancy, in the case of *Gentiruco AG v Firestone SA (Pty) Ltd*, the court held that "the true and practical test for the admissibility of the opinion of a skilled person is whether or not the court can receive appreciable help from that witness in the particular issue."[46] The court further held that the test is relative and depends on the particular subject and the witness with reference to that subject.[47] Apart from the

[37] S de Wet & others 'DNA profiling and the law in South Africa' (2011) 14 *Potchefstroom Electronic Law Journal* at 173-174.
[38] Meintjes-Van der Walt (n1) at 24.
[39] Meintjes-Van der Walt (n1) at 24.
[40] De Wet (n37) at 174.
[41] *S v M* 2002 (2) SACR 44 (SCA) para 31. Also see Schwikkard & Van der Merwe (n13) at 421 and Bellengère (n9) at 110.
[42] Schwikkard & Van der Merwe (n13) at 421.
[43] L Meintjes-Van der Walt 'Ruling on expert evidence in South Africa: A comparative analysis' (2001) 5 *The International Law Journal of Evidence and Proof* at 228.
[44] Meintjes-Van der Walt (n43) at 228.
[45] Meintjes-Van der Walt (n43) at 228.
[46] *Gentiruco AG v Firestone SA (Pty) Ltd* 1972 (1) SA 589 (A) at 616H. If the opinion will not be of any value to the proceedings, it would merely be a waste of time to admit it as evidence.
[47] *Gentiruco AG v Firestone SA (Pty) Ltd* 1972 (1) SA 589 (A) at 616H.

oral testimony of a witness, DNA evidence may also be proved by way of an affidavit in compliance with section 212(4) of the Criminal Procedure Act.[48]

2.3.3 Relevance and Admissibility of DNA evidence

One of the key components of the admissibility of evidence is that the evidence must be relevant to an issue in the proceedings,[49] and as mentioned this is the only admissibility requirement of DNA evidence. Section 210 of the Criminal Procedure Act states that, "no evidence as to any fact, matter or thing shall be admissible which is irrelevant or immaterial and which cannot conduce to prove or disprove any point or fact in issue in criminal proceedings".[50] It is trite that admitting irrelevant evidence will result in prolonging the duration of the trial unnecessarily and will further result in wasting time and resources as well as parties incurring additional costs that would have otherwise been avoided.[51] Furthermore, including evidence that is irrelevant in the proceedings might result in the actual issues being overshadowed or overlooked due to the inclusion of irrelevant information.[52]

Determining whether the particular piece of evidence, including DNA evidence, is regarded as irrelevant, is simply an indication that such evidence is irrelevant from a common-sense perspective or that it is simply not relevant enough for the purposes of the trial and that admitting such evidence will be a setback in the proceedings.[53]

In *R v Randall*, it was stated that relevancy is determined by common sense and experience.[54] However, to determine relevance, there is a general test that presiding officers can use.[55] The first test that is applied is that of logic and reasoning based on probability.[56] Secondly, the presiding officer will need to analyse whether admitting that particular piece of evidence will be procedurally desirable to the proceedings and

[48] Criminal Procedure Act 51 of 1977 sec 212(4)(a) states that "whenever any fact established by an examination or process requiring any skill in (i) biology, chemistry, physics…. (v) biochemistry, metallurgy, microscopy, in any branch of pathology or toxicology or (vi) in ballistics, in the identification of fingerprints or body-prints…." is or becomes relevant to the issues in criminal proceedings, a person may produce an affidavit stating that such fact by means of the particular examination process, shall upon its mere production serve as *prima facie* proof of such fact.
[49] Bellengère (n9) at 52.
[50] Criminal Procedure Act 51 of 1977 sec 210.
[51] Schwikkard & Van der Merwe (n13) at 50.
[52] Schwikkard & Van der Merwe (n13) at 50.
[53] Zeffertt & Paizes (n2) at 84.
[54] *R v Randall* [2004] 1 WLR 56 (HL) at para 20.
[55] Bellengère (n9) at 161.
[56] Bellengère (n9) at 161.

that it will not lead to confusion or result in any material disadvantage.[57] Lastly, the rules of exclusion are based on certain legal rules.[58] In *R v Solomons*, the court held that a decision on the admissibility of evidence could be reversed at a later stage due to new factual issues that are revealed during the trial proceedings.[59]

DNA evidence may be found to be relevant to an issue in the proceedings, but this does not automatically mean it is deemed legally admissible.[60] DNA evidence, although relevant, may be excluded due to other reasons such as being illegally obtained or obtained in breach of the Constitution.[61] Section 2 of the Constitution states that "the Constitution is the supreme law of the Republic and any law or conduct that is inconsistent with it is invalid, and the obligations imposed by it must be fulfilled."[62] Furthermore, section 35 (5) of the Constitution states that:

> "evidence obtained in a manner that violates any rights in the Bill of Rights must be excluded if the admission of that evidence would render the trial unfair or otherwise be detrimental to the administration of justice."[63]

This right was established as a way to enforce and protect fundamental human rights while promoting and enhancing judicial integrity.[64] The exclusion was further aimed at minimising unlawful police conduct during the pre-trial criminal procedure.[65] It is imperative to note that the exclusion does not apply automatically and that the court has to first reach the conclusion that if such evidence were to be admitted it would either render the trial unfair or be detrimental to the administration of justice.[66] In *S v Mthembu*, the court held that evidence that is obtained in a manner that violates the constitution may still be admissible provided that the conduct of the police officers was reasonable and justifiable.[67] Therefore, the nature of the violation and the impact that

[57] Bellengère (n9) at 161.
[58] Bellengère (n9) at 161.
[59] *R v Solomons* 1959 (2) SA 352 (A) at para 362 E-F. Therefore, the admissibility of evidence may be re-evaluated at a later stage.
[60] Bellengère (n9) at 54.
[61] Bellengère (n9) at 55.
[62] The Constitution of the Republic of South Africa, 1996 sec 2.
[63] The Constitution of the Republic of South Africa, 1996 sec 35(5).
[64] Schwikkard & Van der Merwe (n13) at 200.
[65] JJ Joubert (ed.) *Criminal Procedure Handbook* (2017) at 28.
[66] Joubert (n65) at 28.
[67] *S v Mthembu* 2008 (2) SACR 407 (SCA) at para 26.

the unconstitutionally obtained evidence will have on the integrity of the administration of justice, in the long run, ought to be considered.[68]

2.4 Chain of evidence

The evidentiary chain of DNA evidence commences well before the trial.[69] From the moment the sample is discovered and collected, it is important to maintain the integrity and security of that sample.[70] The chain of custody plays a vital role in verifying the authenticity and the legal integrity of a sample that has been sent for testing.[71] The collection and preservation of such DNA evidence directly affect whether the particular piece of evidence will be admissible in court.[72] The chain of custody requirement is aimed at achieving two objectives. Firstly, it is aimed at laying a proper foundation that will assist in connecting the evidence to the perpetrator or a place that is connected and relevant to the case.[73] Secondly, it is aimed at ensuring that the object is exactly what its proponent claims it to be.[74] Therefore, the purpose of the chain of evidence is to link the evidence to the crime, to link the evidence to the sample analysis and to ensure and prove that the evidence was stored properly and has not been contaminated.[75] During the chain of custody, it is imperative to ensure that the DNA samples were adequately preserved at each stage of the process, therefore, a proper system of bagging and labelling needs to exist.[76]

Evidence is usually collected from the crime scene by forensic field workers or in other cases, it can be collected by police detectives.[77] In some situations, medical and healthcare workers may be permitted to collect DNA samples from a victim and a

[68] *S v Mthembu* 2008 (2) SACR 407 (SCA) at para 26.
[69] Bellengère (n9) at 471.
[70] A Holobinko 'Forensic human identification in the United States and Canada: A review of the law, admissible techniques and the legal implications of their application in forensic cases' (2012) 222 *Forensic Science International* at 394.e2. Meintjes-Van der Walt (n4) at 14.
[71] Meintjes-Van der Walt & Dhliwayo (n33) at 9.
[72] Holobinko (n70) at 394.e2.
[73] Meintjes-Van der Walt (n4) at 14.
[74] Meintjes-Van der Walt (n4) at 14.
[75] Meintjes-Van der Walt (n4) at 14.
[76] Meintjes-Van der Walt & Dhliwayo (n33) at 10.
[77] Meintjes-Van der Walt (n4) at 13. Section 36D of the Criminal Procedure Act regulates the manner in which bodily samples, buccal samples and crime scene samples may be taken and who is authorised to take such samples. Section 37 gives police officials to take an accused's fingerprints, body prints or buccal samples. Section 37(1)(c) prohibits any police officer from taking a blood sample of any person or to examine the body of a person who is of the opposite gender to the police official.

suspect.[78] During the chain of custody, every person who came into contact with the evidence must be accounted for as the prosecution will have to prove that the evidence was safeguarded and has not been tampered with.[79] Every step of the sample's journey, from the time it was collected, to the time it was submitted for analysis must be accounted for.[80] This includes the mode of transportation of the sample, the person in whose care the sample was placed as well as the container in which the sample was stored.[81] The person who collects the sample from the crime scene, the person who receives the sample into their custody as well as the laboratory, all need to present an affidavit relating to the contact they had with the sample as well as the manner in which they received the sample.[82]

Section 212(8) of the Criminal Procedure Act allows for an affidavit to be produced as *prima facie* proof in criminal proceedings regarding the

> "collection, receipt, custody, packing, making, delivery or despatch of any fingerprint or body-print, article of clothing, specimen, bodily sample, crime scene sample, tissue or any object of whatever nature that is relevant to the issues."[83]

The affidavit must allege that such persons (as listed in section 212(8)), in the performance of their official duties received, delivered or dispatched from or to any person, institution, state department or any other body specified in the affidavit any DNA evidence as described in the affidavit, which was packed or marked or as the case may be, which he or she packed or marked in the manner that is described in the affidavit.[84] Furthermore, such persons who were in the custody of any of the abovementioned evidence must allege in the affidavit the specific time period in which they were in the custody of such evidence.[85]

[78] Meintjes-Van der Walt (n4) at 13. Section 36D(2) and section 37(2)(a) of the Criminal Procedure Act gives registered medical practitioners or registered nurses the power to take bodily samples.
[79] Meintjes-Van der Walt (n4) at 14.
[80] Bellengère (n9) at 472.
[81] Bellengère (n9) at 472.
[82] The Criminal Procedure Act 51 of 1977 sec 212.
[83] The Criminal Procedure Act 51 of 1977 sec 212(8).
[84] The Criminal Procedure Act 51 of 1977 sec 212(8)(a)(ii)(aa) & (bb).
[85] The Criminal Procedure Act 51 of 1977 sec 212(8)(a)(ii)(cc).

There are certain technical guidelines that laboratories need to follow for forensic DNA testing.[86] These guidelines are provided for by the South African National Accreditation System (SANAS).[87] These guidelines include but are not limited to:[88]

a) Using equipment that is suitable for the methods employed

b) Conducting annual audits

c) Using validated methods and procedures

d) Following procedures for monitoring, cleaning and decontaminating facilities and equipment

e) Ensuring that all laboratory personnel are well trained, educated and have experience with the type of examination or testing that is required

f) Conduct administrative and technical reviews of case files and reports to ensure that conclusions and supporting data are reasonable and within the constraints of scientific knowledge.

In addition to these guidelines, laboratories are required to have an evidence control system that should be accurately followed in order to ensure that the integrity of physical evidence is not compromised during the testing stages or during any stage where the samples are being handled.[89] The purpose of this system could be to ensure that physical evidence is correctly marked and labelled for identification purposes, the chain of custody is maintained, procedures that are followed regarding the testing and handling of samples are designed to lower the risk of contamination and that there are secure areas in which the evidence can be stored.[90]

2.5 Pre-trial discovery/disclosure

The chain of custody plays a huge role in the pre-trial stages of criminal proceedings as it will determine the admissibility of the scientific evidence produced; if admissible it may influence the weight that is to be attached to the evidence and therefore the

[86] De Wet (n37) at 188.
[87] See South African National Accreditation Systems 'Technical guidelines for forensic DNA testing laboratories' May 2020 https://www.sanas.co.za/Publications%20and%20Manuals%20Files/TG%2042-03.pdf (accessed on 09 September 2022).
[88] De Wet (n37) at 188.
[89] South African National Accreditation Systems (n87) at 8.
[90] South African National Accreditation Systems (n87) at 8.

manner in which the accused prepares his or her defence. Pre-trial disclosure of evidence plays a critical role regarding the accused's right to a fair trial and is meant to afford the defence enough time to adequately prepare and competently challenge the evidence presented by the prosecution.[91] The main purpose of this process is to provide notice to the defence of all the evidence that the prosecution is in possession of in order to enable the defence to prepare.[92] The quality of information that is available to the parties is of paramount importance in ensuring fairness and access to justice.[93]

Before the interim Constitution, the prosecution could withhold the information in the police docket as well as the information and documents pertaining to the case, thus obtaining the privilege of the police docket.[94] The state would only furnish the defendant with information relating to medical reports, a list of expert witnesses that were to testify as well as the results of scientific tests.[95] However, docket privilege was challenged after the adoption of the interim Constitution as well as in *Shabalala v Attorney-General of Transvaal.*[96] It was argued that docket privilege created an unjustifiable limitation on several rights.[97] Both section 35(3)(a) of the Constitution which contains the right of the accused to be informed of the charge with sufficient detail to answer to it, as well as section 35(3)(i) which regulates the right of the accused to adduce and challenge evidence would be violated by docket privilege.[98]

As a result of these rights, the prosecution is now required to provide the defence with all the information including information on all the evidence that the prosecution is in possession of even if such evidence will benefit the defence.[99] Concealing such evidence and withholding it from the accused would impede the accused's right to a fair trial and thus undermine the principle of access to justice as well as the

[91] Meintjes-Van der Walt (n4) at 27. Also see Bellengère (n9) at 472. Section 35(3)(b) of the Constitution specifically determines that the right to a fair trial includes the right to have adequate time and facilities to prepare a defence.
[92] L Meintjes-Van der Walt 'Pre-trial Disclosure of expert evidence: lessons from abroad' (2000) 13(2) *South African Journal of Criminal Justice* at 145.
[93] Meintjes-Van der Walt (n4) at 27.
[94] Meintjes-Van der Walt (n92) at 146-147.
[95] Meintjes-Van der Walt (n92) at 147.
[96] *Shabalala and Others v Attorney-General of the Transvaal and Another* 1996 (1) SA 725.
[97] Meintjes-Van der Walt (n92) at 147.
[98] Meintjes-Van der Walt (n92) at 150.
[99] DWM Broughton 'The South African Prosecutor in the face of adverse pre-trial publicity' (2020) 23 *Potchefstroom Electronic Law Journal* at 15. Meintjes-Van der Walt (n92) at 156.

administration of justice.[100] While the prosecution is obliged to provide such information to the defence, however, has no reciprocal duty to disclose evidence to the prosecution.[101] There are several advantages of pre-trial disclosure with specific relevance to scientific evidence, these advantages include but are not limited to:

a) Achievement of equality between parties
b) Contribution to facilities available to the defence's preparation
c) Awareness of potential witnesses the prosecution tends to call
d) Minimizing the potential miscarriages of justice in the absence of disclosure or inadequate disclosure
e) Allowing the defence to scrutinise the investigation process, therefore, assisting the search for the truth.[102]

It is safe to say that if the accused did not have a proper opportunity to prepare for the trial based on the discovery, this can highly affect the outcomes of the trial and further hinder the administration of justice. Inadequate pre-trial disclosure of scientific evidence will also lead to miscarriages of justice as the criminal justice system cannot adequately deal with scientific evidence without the proper use of science in the courtroom.[103]

2.6 Evaluation of DNA evidence in courts

When dealing with DNA evidence, a distinction needs to be made between direct and indirect evidence, the latter of which is often described and referred to as circumstantial evidence.[104] Facts in issue may be proved by one of the two. This distinction is of huge importance in circumstances where an accused does not want to testify in their own defence.[105] Circumstantial evidence relies upon facts which are proved by direct evidence.[106] As a result, it has been argued that circumstantial evidence will carry less weight than direct evidence, however, this is not true as in some instances the courts have regarded circumstantial evidence to be more convincing than direct evidence.[107] Scientific evidence such as DNA evidence falls

[100] Broughton (n99) at 15.
[101] Meintjes-Van der Walt (n92) at 150.
[102] Meintjes-Van der Walt (n92) at 156 and Meintjes-Van der Walt (n4) at 28.
[103] Meintjies-Van der Walt (n90) at 155.
[104] Meintjes-Van der Walt & Dhliwayo (n33) at 5-6.
[105] Schwikkard & Van der Merwe (n13) at 23.
[106] Zeffertt & Paizes (n2) at 23.
[107] Zeffertt & Paizes (n2) at 23-24.

under the category of circumstantial evidence as the courts need to draw inferences from it.[108] When determining the weight of the evidence that has been presented, the court ought to apply "coherent, logical thought to the objective analysis of the evidence".[109]

In criminal cases there are two cardinal rules of logic that were laid down in the case of *R v Blom* concerning the use of circumstantial evidence:[110]

1. The inference sought to be drawn must be consistent with all the proved facts. If it is not, then the inference cannot be drawn.

2. The proved facts should be such that they exclude every reasonable inference from them save the one sought to be drawn. If they do not exclude other inferences, then there must be a doubt whether the inference sought to be drawn is correct.

The first rule that was laid down, in this case, raises a number of vital questions such as what standard of proof has been utilised in order to determine whether a fact has been proved, does that standard of proof rely on whether the fact is an ultimate issue or just an intermediary fact, if it is an intermediary fact, does the standard employed apply for both civil or criminal proceedings.[111] The second rule of logic is mostly based on the principle that in criminal proceedings, the state ought to provide proof beyond a reasonable doubt.[112]

In *Godla v S*, the court stated that when dealing with circumstantial evidence, the courts must not only look at the evidence of the state or of the accused separately but rather view all the separate pieces of circumstantial evidence as a whole.[113] When a court deals with circumstantial evidence they ought to always take into account the cumulative effect of all the evidence.[114] In the case of *S v SB*,[115] the court held that if a DNA sample that was found at a crime scene, matches the DNA profile of the accused, then such evidence is considered to be circumstantial evidence and the weight that is attached to it depends on various factors.[116] These factors include the

[108] Zeffertt & Paizes (n2) at 23.
[109] Bellengère (n9) at 57.
[110] *R v Blom* 1939 AD 188 at para 202-203.
[111] Zeffertt & Paizes (n2) at 24.
[112] Schwikkard & Van der Merwe (n13) at 579.
[113] *Godla v S* (A98/2009) [2011] ZAFSHC 46 at para 9.
[114] Schwikkard & Van der Merwe (n13) at 578.
[115] *S v SB* 2014 (1) SACR 66 (SCA).
[116] Du Toit & others *Commentary on the Criminal Procedure Act* (2018) at 98B.

proper establishment of a chain of custody, the proper functioning of machines and equipment that were used in testing the samples and producing the electropherograms,[117] the acceptability of the interpretation of the electropherograms, the probability of the match and the specific circumstances as well as other evidence that is part of the case.[118]

2.7 Conclusion

It is important that the manner in which the sample is being handled does not alter the sample in any way possible. The manner in which the sample is handled and kept remains essential for the trial proceedings and the outcome of the trial. Furthermore, samples are to be handled accurately according to the laboratory guidelines to ensure that none of the accused's rights is violated in the process, therefore impeding access to justice. The manner in which the DNA sample is preserved and handled plays a vital role regarding the admissibility of such evidence as well as the weight that will be attached to it by the courts. Therefore, all persons who come into contact with the sample either before, during or after testing, need to follow the correct procedures and measures that have been put into place to avoid human error. Although the evidence may pass the pre-trial stages and the relevancy test, it does not automatically mean such evidence to be admissible in a court of law due to the exclusionary rules of evidence that exist. Furthermore, the mere fact that the evidence is admissible does not mean that there are no shortcomings concerning DNA evidence. In the following chapters, the admissibility requirements of the USA will be discussed in comparison to that of South Africa as well as the shortcomings of DNA evidence which will be expanded on in Chapter 4.

[117] Electropherograms refer to "computer generated graphs produced when DNA fragments produced by a polymerase chain reaction technique are subject to a process called electrophoresis." See Chapter 4 for more details on DNA testing.
[118] Du Toit (n116) at 98B.

CHAPTER 3: EVIDENTIARY RULES OF DNA EVIDENCE IN THE UNITED STATES OF AMERICA

3.1 Introduction

The scientific validity of DNA evidence is no longer a seriously contested issue in the United States of America (USA), after decades of legal fights and contentious academic debate.[1] The issue of DNA evidence in the USA is now one of proficiency rather than validity.[2] The USA, like South Africa, also makes use of certain evidentiary rules to regulate the admissibility of DNA evidence in criminal proceedings. The manner in which criminal trials are conducted and the admissibility rules in the USA differ from that of South Africa in several material ways. Although they also follow the Anglo-American adversarial system, there are a few differences that ought to be noted. This chapter aims to discuss the legal system of the USA focussing on the manner in which criminal trials are conducted. Moreover, this chapter will analyse the rules of admissibility that are followed regarding the admission of DNA evidence in criminal proceedings. The USA makes use of Federal laws and State laws, however, for the purposes of this chapter, the focus will be on Federal law which includes Federal Rules of Evidence as well as the Federal Rules of Criminal Procedure.

3.2 Short overview of the American legal system

The USA forms part of the Anglo-America accusatorial system just like South Africa, however, unlike South Africa, the USA continues to make use of the jury system which was abolished in South Africa by the Abolition of Juries Act 34 of 1969.[3] In the American legal system, jurors play a very significant role in the court system.[4] Trial by jury is regulated by Rule 23 of the Federal Rules of Criminal Procedure.[5] A jury

[1] R McDonald 'Juries and crime labs: Correcting the weak links in the DNA chain' (1998) 24(2&3) *American Journal of law and Medicine* at 345.
[2] McDonald (n1) at 345.
[3] South African Law Commission 'Simplification of Criminal Procedure (Access to the Criminal Justice System)' (1997) Issue Paper 6 Project 73 at 17.
[4] Unknown 'Handbook for trial jurors serving in the United States District Courts' (2003) https://www.uscourts.gov/sites/default/files/trial-handbook.pdf (accessed on 01 October 2022).
[5] In accordance with Rule 23, "if the defendant is entitled to a jury trial, the trial must be by jury unless the defendant waives a jury trial in writing and the government consents and the court approves."

generally consists of 12 people;[6] however, the parties may request a smaller jury.[7] While the jury judges the facts of the case, the judge decides how the law will be implemented.[8] Jurors begin to process information and evidence from the start of the trial, weaving evidence into a captivating narrative or story.[9] Jurors frequently fill in gaps in the evidence and deal with discrepancies in accordance with the overall narrative they are developing.[10] In the case of a non-jury trial, the presiding officer has the duty of finding the defendant guilty or not guilty.[11]

Both high acclaim and high scorn have been shown for the American jury.[12] The collaboration of judge and jury working together in a shared endeavour puts the ideas of American great heritage of freedom into practice.[13] Furthermore, it is substantially responsible for safeguarding the rights and liberties of American citizens.[14] Trial by jury was intended to be a way of humanising the law or replacing the strictures of a more or less inflexible institution with that of societal norms of fairness and decency.[15] This system was also seen as an advantage as citizens would be able to acquire knowledge of how the state is run, in case they might end up being employed by the state.[16] Despite some of these advantages and arguments that trial by jury is more effective, there has been a drastic decline in jury trials in both Federal and State courts.[17] Trial by jury in Federal criminal cases has decreased from 8.2% in 1962 to less than 5% in 2002 and 3.6% in 2013.[18] Verdicts that are passed by a jury trial are at a disadvantage as the verdicts are now seen as weak due to the decline of jury trials.[19]

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[6] Jurors consist of men and women with good judgement, total honesty and who have a strong sense of fairness and justice Unknown (n4).
[7] Fed. R. Crim. P. Rule 23 (b) (1) & (2). This request ought to be done by the parties at any time prior to the verdict and should be stipulated in writing.
[8] Unknown (n4) at 1.
[9] VP Hans 'US Jury reform: The active jury and the adversarial idea' (2002) 21(1) *Saint Louis University Public Law Review* at 89.
[10] Hans (n9) at 89.
[11] Fed. R. Crim. P. Rule 23 (c).
[12] RT Shepard 'Jury trials aren't what they used to be' (2005) 38 *Indiana Law Review* at 859.
[13] Unknown (n4).
[14] Unknown (n4).
[15] EV Mittlebeeler 'Race and Jury in South Africa' (1968) 14(1) *Howard Law Journal* at 103.
[16] Mittlebeeler (n15) at 103-104.
[17] SS Diamond & JM Salerno 'Reasons for the disappearing jury trial: Perspectives from attorneys and judges' (2020) 81 *Louisiana Law Review* at 122.
[18] Diamond & Salerno (n17) at 122.
[19] Diamond & Salerno (n17) at 163.

When dealing with DNA evidence, trial by jury can be a disadvantage as jurors frequently lack awareness of the most recent forensic and scientific findings.[20] It is important that jurors understand how DNA evidence is used, what it can and cannot show, and how it is employed.[21] Additionally, jurors must be made aware of the stats of wrongful convictions as well as what to look for and what to avoid.[22] Jurors are often unaware that there is room for error when interpreting DNA evidence especially given how highly DNA evidence is relied upon.[23] Furthermore, it has been argued that jurors may be swayed by erroneous notions about DNA evidence and the justice system as a result of television shows.[24]

3.3 Admissibility rules of DNA evidence

Real evidence can be described as "an item that was directly involved in the events that are in issue in the case".[25] Physical evidence such as DNA evidence is categorised as real evidence and must, therefore, be authenticated before it can be presented in a trial court.[26] The prosecution must rely on physical evidence that is discovered at the crime scene unless the perpetrator is apprehended at the scene of the crime or is recognised as the perpetrator of the crime by witnesses or the victim.[27] The physical evidence frequently consists of items that are subject to scientific analysis.[28] The Federal Rules of Evidence do not consist of a specific rule that is aimed at regulating the admissibility of DNA evidence as a result, the USA relies heavily on expert testimonies regarding the presentation of DNA evidence.[29] As science keeps advancing and evolving at a rapid pace, it becomes necessary to utilise expert witnesses who are able to explain the scientific methods that have been used for testing the scientific evidence as well as to explain the results of these tests.[30] In the USA the reliability of the technique that was used plays a huge role in determining

[20] KC Boies 'Misuse of DNA evidence is not always a harmless error: DNA evidence, prosecutorial misconduct and wrongful convictions' (2011) 17(4) *Texas Wesleyan Law Review* at 440.
[21] Boies (n20) at 440.
[22] Boies (n20) at 440.
[23] Boies (n20) at 409.
[24] NR Behrouzfard 'Strengths, limitations and controversies of DNA evidence' (2006) 1 *Southern New England Roundtable Symposium Law Journal* at 138-139.
[25] A Rosenfeld 'Admissibility of DNA evidence: Italy under attack' (2012) 40(1) *Southern University Law Review* at 215.
[26] Rosenfeld (n25) at 215.
[27] Rosenfeld (n25) at 210.
[28] Rosenfeld (n25) at 210.
[29] Unknown 'Admissibility of DNA evidence' (1996) 12(2) *Touro Law Review* at 625.
[30] Z Alter 'Unpacking Frye-Mack: A critical analysis of Minnesota's Frye-Mack standard of admitting scientific evidence' (2017) 43(3) *Mitchell Hamline Law Review* at 627.

whether scientific evidence will be admissible. Therefore, obtaining the testimony of an expert with regard to the scientific method that has been used and the results of the test will assist the court in their deliberation when deciding on the admissibility of scientific evidence.[31] Despite this process, judges and juries are at risk of being tainted with unreliable junk science, as a result, there have been certain admissibility standards that have been established to reduce the risk of admitting junk science in criminal proceedings.[32] These standards of admissibility will be discussed below.

3.4 Relevancy

Similar to South Africa, before any evidence can be admitted, and before it can be determined how much weight should be attached to a particular piece of evidence, such evidence ought to first pass the test of relevancy, including DNA evidence.[33] Rule 401 of the Federal Rules of Evidence states that evidence will be relevant if "it has any tendency to make a fact more or less probative than it would be without the evidence and the fact is of consequence in determining the action."[34] Furthermore, in accordance with Rule 402:[35]

> "irrelevant evidence will not be admissible, and that relevant evidence will be admissible unless the United States Constitution, a Federal Statute, rules of evidence or any other rules prescribed by the Supreme Court state otherwise."

Another similarity to South Africa is that relevant evidence may also be excluded, however, the factors that ought to be taken into consideration in the USA differ from those of South Africa. In the USA, evidence may be excluded provided that the court is of the view that the probative value of such evidence is substantially outweighed by the danger of one or more of the following reasons: "unfair prejudice, confusing the issues, misleading the jury, undue delay, wasting time or needlessly presenting cumulative evidence".[36] Once the evidence has been regarded as relevant, there are two different legal standards or tests that can be utilised in order to determine the admissibility of DNA evidence in criminal proceedings.[37] These legal standards are

[31] Alter (n30) at 627.
[32] Alter (n30) at 627.
[33] Behrouzfard (n24) at 117.
[34] FRE Rule 401.
[35] FRE Rule 402.
[36] FRE Rule 403.
[37] Behrouzfard (n24) at 117.

known as the Frye standard or test which was developed in *Frye v United States*[38] and the Daubert standard which was developed in *Daubert v Merrell Dow Pharmaceuticals*.[39]

3.5 Frye Standard

The original test regulating the admissibility of scientific evidence as well as the special rules pertaining to the admissibility of scientific evidence were first set out in *Frye v United States* where it was stated that in order for scientific evidence to be admissible, it must be "sufficiently established to have gained general acceptance in the particular field in which it belongs".[40] In applying this standard, scientific evidence would only be admissible in court if the procedure that was used to test the specific sample had in fact gained general acceptance in the field in which it belongs, therefore, excluding experimental, novel or theoretical procedures.[41] In determining the "specific scientific community" the courts will only take into account scientists who have the specific scientific background and training; who possess the knowledge and understanding of the scientific process that was used; and who can form an opinion about the specific scientific method that was used.[42] Therefore, not all scientists are considered, just those who have direct experience with the specific type of scientific evidence or procedure in question. Once the evidence is admitted, the jury will then take into consideration the testimony of the expert as well as the testimonies relating to the collection of the evidence to determine the weight of the scientific evidence, including DNA evidence.[43]

Both the Federal courts and State courts found it extremely challenging to make use of this test as the inquiry focused on the general reliability of the evidence as a whole, instead of focusing only on the reliability of a specific piece of evidence.[44] Apart from the reliability issue, the test was further scrutinised as it was unclear as to what type

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[38] *Frye v United States* 293 F.1013 (D.C Cir 1923).
[39] *Daubert v Merrell Dow Pharmaceuticals Inc* 509 U.S 579 (1993).
[40] *Frye v. United States* (n38) at 1014. See also in general Behrouzfard (n24) at 117-118; Unknown (n29) at 625 and JA Goodwin & L Meintjes-Van der Walt 'The use of DNA evidence in South Africa: Powerful tool or prone to pitfalls' (1997) 114(1) *South African Law Journal* at 167.
[41] EA Youngstrom & CP Busch 'Expert testimony in psychology: Ramifications of Supreme Court decision in *Kumho Tire Co Ltd. v. Carmichael*' (2000) 10 *Ethics and Behavior* at 186. See also Unknown (n29) at 626.
[42] RA Fiatal 'DNA testing and the Frye standard' (1990) 59(6) *FBI Law Enforcement Bulletin* at 28.
[43] Unknown (n29) at 630.
[44] Behrouzfard (n24) at 118. Also see LD Whitmore 'The Admissibility of DNA evidence in criminal proceedings' (1993) 39(3) *Wayne Law Review* at 1412.

of evidence is required to substantiate that the experts' claims were generally accepted within the specific scientific community.[45] In addition, the reliability of this test was further questioned as the court found that this test unfairly discredited new tests and principles.[46] The Frye standard was rejected 70 years later by the United States Supreme Court which came to the consensus that the test set up in *Frye* was not appropriate for Federal courts and that a new standard was necessary.[47] The Federal circuits rejected *Frye* as it was determined that this test has the potential of rejecting new evidence although such evidence is relevant.[48] Up until the Federal Rules of Evidence came into force in 1975, the Frye standard remained the standard that was used for evaluating whether expert testimonies were admissible.[49] The Federal Rules of Evidence established the notion of relevance as the fundamental standard for assessing admissibility, as well as Rule 702 which will be discussed below.[50] Even after the introduction of the Federal Rules of Evidence, the courts still kept applying the Frye standard.[51] The Supreme Court of Appeal then developed a new standard called the "Daubert standard" where it was decided that the Federal Rules of Evidence superseded the test in Frye.[52] The Daubert standard was further established with the hopes of resolving the conflict between Frye and the Federal Rules of Evidence as the courts began to apply the Frye standard and Rule 702 inconsistently.[53]

3.6 Daubert Standard

In 1993, the Supreme Court developed the Daubert standard in *Daubert v Merell Dow Pharmaceuticals*, this standard has been adopted by Federal courts as well as some State courts.[54] The Supreme Court held that the test developed in *Frye* was not enough to determine whether a specific scientific technique should be admitted in court.[55] The Daubert standards' primary objective was to impose stricter regulations on expert testimony and to do away with the use of junk scientific evidence in the

[45] Behrouzfard (n24) at 118.
[46] Behrouzfard (n24) at 118.
[47] Alter (n30) at 627.
[48] Whitmore (n44) at 1425.
[49] Youngstrom & Busch (n41) at 186.
[50] Youngstrom & Busch (n41) at 186.
[51] Youngstrom & Busch (n41) at 186.
[52] Youngstrom & Busch (n41) at 186.
[53] Alter (n30) at 630 and Whitmore (n44) at 1412.
[54] L Fournier 'The Daubert guidelines: Usefulness, utilization and suggestions for improving quality control' (2016) 5 *Journal of Applied Research in Memory and Cognition* at 308.
[55] Goodwin & Meintjes-Van der Walt (n40) at 167-168.

courtrooms.[56] In developing this standard, the court made use of Rule 702 of the Federal Rules of Evidence which regulates the admissibility of expert testimonies.[57] Before the Daubert standard was established Rule 702 read as follows:

> "if scientific, technical or other specialised knowledge will assist the trier of fact to understand the evidence or to determine a fact in issues, a witness qualified as an expert by knowledge, skill, experience, training or education may testify thereto in the form of an opinion or otherwise."[58]

Rule 702 has been amended several times and after the Daubert standard was established, Rule 702 now states that:

> "a witness who is qualified as an expert by knowledge, skill, experience, training or education, may testify in the form of an opinion or otherwise if the experts scientific, technical or other specialised knowledge will help the trier of fact to understand the evidence or to determine a fact in issue, the testimony is based on sufficient facts or data, testimony is the product of reliable principles and methods, and the expert has reliably applied the principles and methods to the facts of the case."[59]

Therefore, the prosecution is required to provide evidence that the method or technique that has been used regarding the scientific evidence, is indeed reliable.[60]

There are four guidelines that judges ought to apply when making use of this standard, namely, testability, peer review and publication, error rate and general acceptance.[61] Testability refers to the idea upon which the scientific evidence is based must be testable and debatable.[62] The ideas and methods that have been used should have undergone adequate testing to prove their dependability and it is the duty of the fact-finders to make this determination.[63] Peer review and publication refers to whether the theory or technique that the expert has used to support his claim is based on peer-reviewed publications, where the evaluation of the internal validity and statistical reliability of the presented evidence have been evaluated.[64] Error rate refers to the

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[56] Fournier (n54) at 308. Also see Federal Procedure: Lawyers edition (2022) WestLaw section 80:210.
[57] Goodwin & Meintjes-Van der Walt (n40) at 168 and Alter (n30) at 630.
[58] FRE Rule 702 (Before Amendment).
[59] FRE Rule 702.
[60] Goodwin & Meintjes-Van der Walt (n40) at 168.
[61] *Daubert v. Merrell Dow Pharmaceuticals Inc* 509 U.S. 579 (1993) at 593-594. See also in general Fournier (n54) at 308 and *United States of America v Shea* 957 F.Supp. 331 (1997) at 345.
[62] Fournier (n54) at 308 and L Meintjes-Van der Walt 'The proof of the pudding: The presentation and proof of expert evidence in South Africa' (2003) 47(1) *Journal of African Law* at 101.
[63] Fournier (n54) at 308 and Meintjes-Van der Walt (n62) at 101.
[64] Fournier (n54) at 308.

known or potential error rate of a specific scientific technique that the expert has used to support their scientific evidence.[65] If a technique has an unknown error rate it is possible that the technique in question has not been sufficiently tested.[66] General acceptance refers to the acceptance of the technique in the specific scientific community.[67]

The court did not consider this to be an exhaustive list but as guidelines to assist the court in strengthening the admissibility standard of scientific evidence.[68] It has been argued that out of the four guidelines that the Supreme Court has established, two guidelines are of higher importance namely- testability and error rate.[69] The reason for this is that these two guidelines have direct relevance in determining the scientific validity of the evidence that the court relies on.[70] Furthermore, when applying the Daubert standard, a preliminary hearing is required to ascertain whether the expert accurately carried out the scientific procedure that was required for the specific DNA sample.[71] During this preliminary hearing, the presiding officer is burdened with the duty of ensuring that the testimony of the expert is both relevant and reliable.[72] As a result, scientific evidence will not be accepted if its proponent is unable to persuade the court of its evidentiary reliability.[73]

3.7 Chain of Evidence

One of the most pressing concerns facing the criminal justice system in the USA today is the chain of custody.[74] The chain of custody is far too significant of a matter to be simply skimmed over.[75] Chain of custody refers to the continuous line of responsibility that guarantees the physical security of samples, data, and documents in criminal investigations.[76] The success or failure of a case that is being investigated can be greatly influenced by the chain of custody. An insufficient chain of custody not only

[65] Fournier (n54) at 308-309.
[66] Meintjes-Van der Walt (n62) at 102.
[67] Fournier (n54) at 309.
[68] *Daubert v. Merrell Dow Pharmaceuticals Inc* 509 U.S. 579 (1993) at 594. See also Fournier (n54) at 308.
[69] Fournier (n54) at 309.
[70] Fournier (n54) at 309.
[71] Goodwin & Meintjes-Van der Walt (n40) at 168 and Fournier (n54) at 308.
[72] Federal Procedure: Lawyers edition (n56) section 80:210.
[73] Goodwin & Meintjes-Van der Walt (n40) at 168.
[74] LP Mainali & BP Soti 'Chain of Custody management as a major strategic component in the criminal justice system in Nepal' (2021) 15 *NJA Law Journal* at 67.
[75] McDonald (n1) at 358.
[76] Mainali & Soti (n74) at 67-68. See Chapter 2 at 2.4.

offers the accused the benefit of the doubt, but also gives ammunition to the detractors (the general public and mostly defence lawyers) who contend that official institutions actively assist the state of impunity.[77]

Before DNA evidence may be presented in court, it ought to be authenticated as it falls under real evidence.[78] The requirement for authentication is regulated by Rule 901 of the Federal Rules of Evidence.[79] According to this rule, there are three general principles: firstly, the admission of real evidence requires authentication as a prerequisite.[80] Secondly, proof that the matter in question is what the proponent asserts satisfies the first principle and thirdly, the evidence must be strong enough to back up the conclusion.[81] A chain of custody must be unbroken and spotless for DNA authentication to be valid.[82]

The person who collected the samples at the crime scene and everyone else who came into contact with the sample may be called to the stand to testify to the basic facts that led to the DNA analysis.[83] This process may be used to establish a chain of custody.[84] It is important to prove that there has not been a break in the chain of custody as this is a standard and essential condition for the evaluation of DNA evidence in criminal proceedings.[85] In *United States v Tatum*, the court held that the chain of custody goes to the weight of the evidence and not the admissibility thereof.[86] There are links in the chain of custody and every individual who came into contact with the DNA sample or DNA evidence is represented by a link.[87] A missing link will occur where the state is unable to show culpability for each point in the chain of evidence, as a result, this will destroy the chain of custody and could result in the evidence being inadmissible.[88] In *United States v Ricco*, the court held that:

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[77] Mainali & Soti (n74) at 67.
[78] Rosenfeld (n25) at 215.
[79] FRE Rule 901.
[80] Rosenfeld (n25) at 215.
[81] Rosenfeld (n25) at 215.
[82] Rosenfeld (n25) at 215.
[83] RA Gomez 'Practice Note: Cross examining a witness at trial (Federal)' https://content.next.westlaw.com/practical-law/document/Iae9ccd9c3c6b11eaadfea82903531a62/Cross-Examining-a-Witness-at-Trial-Federal?viewType=FullText&originationContext=document&transitionType=DocumentItem&ppcid=2879e7b217fd479aa771fa1766725cb1&contextD (accessed on 02 October 2022) at 2.
[84] Gomez (n83) at 2.
[85] McDonald (n1) at 357.
[86] *United States of America v Tatum* 548 F.3d 584 (7th Cir. 2008).
[87] McDonald (n1) at 357.
[88] McDonald (n1) at 357-358.

> "establishing a strict chain of custody is not an iron-clad requirement, and the fact of a missing link does not prevent the admission of real evidence, so long as there is sufficient proof that the evidence is what it purports to be and has not been altered in any material respect."[89]

3.8 Pre-trial disclosure

In the USA, the pre-trial discovery of evidence is regulated by Rule 16 of the Federal Rules of Criminal Procedure and this Rule regulates what the government and the defendant must disclose to each other and what cannot be included in the discovery. Unlike discovery in South Africa, the USA has very strict and specific rules for discovery. Rule 16(a) regulates the government's disclosure and states that the government at the request of the defendant, ought to disclose to the defendant the defendant's oral statements, written or recorded statements, the defendant's prior criminal record, documents and objects, reports of examinations and tests as well as expert witnesses.[90] Rule 16(a)(1)(F) which regulates the government's duty to disclose reports of examinations and tests, states that the government must allow the defendant to "inspect, copy or photograph the results or reports of any physical or mental examination and of any scientific test or experiment" if the defendant makes such a request.[91] Unlike South Africa, the Federal Rules of Criminal Procedure also regulate what information is not subject to disclosure.[92] In South Africa, the defendant (or accused) does not have the reciprocal duty to disclose any information to the prosecution,[93] however, in the USA the defendant has the reciprocal duty to disclose.[94] Where the defendant has requested the disclosure of any information under Rule 16(a)(1)(E), which relates to documents and objects, and 16(a)(1)(F), which relates to reports of examinations and tests, and the government has complied with the defendant's request, then the defendant has the reciprocal duty to disclose documents and objects, reports of examinations and test as well as a list of expert witnesses as

[89] *United States of America v Ricco* 52 F.3d 58 (4th Cir. 1995) at 61-62.
[90] Fed. R. Crim. P. Rule 16(a)(1).
[91] Fed. R. Crim. P. Rule 16(a)(1)(F). The government will allow the defendant to do the abovementioned if the item in question is within the government's custody or control, if the attorney for the government knows that such item exists or could know, and if the item is material to preparing the defence or if the government intends to use it for case-in-chief at trial.
[92] Fed. R. Crim. P.Rule 16(a)(2). The government is not permitted to disclose the discovery or inspection of reports, memorandums and other internal government documents or statements made by prospective government witnesses.
[93] See Chapter 2 at 2.5.
[94] Fed. R. Crim. P. Rule 16.

provided for by the Federal Rules of Evidence 702, 703 or 705 to the government for inspection.[95]

In addition to these rules, if any additional evidence or material is discovered before the trial or during the trial by any party, then the party who discovered such evidence ought to disclose the discovery of the evidence in a timely fashion to the other party or the court.[96] The discovery of such evidence ought to be disclosed if the evidence in question would be subject to disclosure in accordance to rule 16 and if the other party had previously requested the disclosure of such evidence or if the court ordered the production of the evidence.[97] Although the pre-trial discovery of evidence is limited to certain categories of evidence, judges may in accordance with Rule 16 broaden the scope of discovery in appropriate circumstances.[98] In some jurisdictions Rule, 16 will apply automatically unless otherwise, the defendant makes the government aware that it declines certain rules of discovery under Rule 16, as a result, it is not a requirement to produce a court order for the discovery of evidence.[99] If the defendant has not requested any discovery under Rule 16 then the government is not bound by the Rule unless State laws determine otherwise.[100] If the government makes use of Rule 16(a)(2), they ought to produce a privilege log to enable the defence to challenge any items that they believe are not protected by this Rule. If the government does not provide the log, then the defence may file a motion compelling the government to produce one.[101] It is important for the government to provide this log in order to ensure transparency and fairness, especially concerning any document that might contain information regarding DNA evidence.

3.9 Evaluation of DNA evidence in courts

The amount of weight that is to be attached to DNA evidence in criminal proceedings comes up during the evaluation of DNA evidence by the jury.[102] Circumstantial

[95] Fed. R. Crim. P. Rule 16(b).
[96] Fed. R. Crim. P. Rule 16(c).
[97] Fed. R. Crim. P. Rule 16(c).
[98] PLC US Law Department, PLC US White Collar Crime & Investigations 'Discovery under Rule 16 of the Federal Rules of Criminal Procedure: Overview' https://www.westlaw.com/w-011-7186?transitionType=Default&contextData=(sc.Default)&VR=3.0&RS=cblt1.0 (accessed on 02 October 2022) at 2.
[99] PLC US Law Department, PLC US White Collar Crime & Investigations (n98) at 2.
[100] PLC US Law Department, PLC US White Collar Crime & Investigations (n98) at 2.
[101] PLC US Law Department, PLC US White Collar Crime & Investigations (n98) at 5.
[102] HR Dash & others *Handbook of DNA Profiling* (2022) at 805.

evidence includes DNA evidence which enables a fact in question to be derived indirectly instead of directly.[103] Circumstantial evidence is used by supplying factual data from which a conclusion about the likelihood of the fact in question can be derived.[104] The fact finder must draw this conclusion from the facts after the forensic scientist has provided the facts.[105] During the evaluation of DNA evidence, the forensic scientist must never directly address the fact in question as he or she is not the fact finder.[106] Only the fact finder has the authority to explicitly form conclusions about the relevant fact after having considered all the relevant evidence including DNA evidence.[107] In the USA, it is therefore the duty of the jury to determine the weight of the evidence by taking into account the relevancy, reliability and accuracy of the testing methods that were used.[108] The weight that the court will attach to scientific evidence depends on the reliability of the testing methods and procedures that were used to test the DNA sample in question.[109] Furthermore, the chain of custody (the manner in which the sample has been transferred), and the sensitivity of forensic testing kits will play a vital role regarding the weight that is attached to the evidence.[110] In addition, the strength of the DNA evidence against the defendant and the appropriate weight that should be attached to the evidence is indicated by the value of a random match probability.[111]

3.10 Conclusion

Although both the USA and South Africa form part of the Anglo-American accusatorial system, the huge difference between these two countries would be the use of jurors in criminal proceedings where the jurors are tasked with evaluating the evidence and handing over the verdict. In South Africa, the judge is the one that is tasked with handing over the judgement regarding the crime committed by the accused. Furthermore, despite both countries using relevancy as the cornerstone for the

[103] Dash (n102) at 806.
[104] Dash (n102) at 806.
[105] Dash (n102) at 806.
[106] Dash (n102) at 811.
[107] Dash (n102) at 811.
[108] LA Robinson 'United States v Two Bulls: Eighth Circuit addresses admissibility of forensic DNA evidence' (1991) 37(1) *Loyola Law Review* at 186.
[109] Robinson (n108) at 180-181.
[110] Dash (n102) at 1011.
[111] Dash (n102) at 812. Random match probability refers to a measure in population genetics to measure the probability of an unrelated person, randomly picked out of the general population and matching the genotype derived from the evidence. It tells us the chance of making a mistake (error rate).

admissibility of evidence, there are different tests or standards that are applied in order to determine the admissibility of scientific evidence. The USA Federal law does not have a specific set of rules regulating the admissibility of scientific evidence and they rely heavily on the rules pertaining to the admissibility of expert testimonies as regulated by the Federal Rules of Evidence. Regarding the pre-trial discovery of evidence, the prosecution in both countries has a duty to disclose, however, in the USA, the prosecution may disclose if the defence requests the specific type of disclosure as regulated in the Federal Rules of Criminal Procedure. In return, the defence will have the reciprocal duty to disclose to the prosecution what they have requested from the prosecution. In South Africa, the defence does not have the reciprocal duty to disclose.

The following chapter will focus on the issues that can arise regarding DNA evidence. These issues are not country specific, however, the uncovering and resolving of these issues differ based on the jurisdiction. As a result, these issues are dealt with after the discussion of the position of the specific countries regarding the admissibility rules. The chapter will also highlight the testing methods that are used for DNA samples as well as the importance of competent and effective legal representation in cases where DNA evidence will be used.

CHAPTER 4: DNA PROFILING TECHNIQUES AND THE SHORTCOMINGS OF DNA EVIDENCE

4.1 Introduction

It is without question that forensic DNA evidence is highly beneficial to the criminal justice system and the praise it receives is indeed merited, however, the notion that forensic DNA evidence is a practice in absolutely objective irrefutable science that is immune to error is untrue.[1] Several DNA profiling techniques are used to analyse DNA samples; however, these DNA profiling techniques are prone to error, much like any other scientific technique that requires the completion of numerous distinct procedures.[2] Over the years DNA profiling techniques have changed and have been modified as a result of technological advances.[3] Most of the time these errors can be avoided, nevertheless, indiscriminate laboratory practices at any point along the process can render the results worthless.[4] DNA samples are rarely gathered from a single source under perfect circumstances, instead, they represent a disorganised collection of many unidentified individuals, which are frequently taken under trying circumstances.[5] As a result, errors may take place at any stage of the process including the collection of the sample, the sealing and safekeeping of the sample, as well as the sending and receiving of samples for testing.[6] Errors may also take place in laboratories as well as during the prosecutor's presentation of the evidence.[7]

This chapter aims to discuss the various types of DNA profiling techniques as well as to address the various types of errors that can occur when dealing with DNA evidence. Furthermore, it will draw attention to the aspects of DNA analysis that make it less trustworthy and will further demonstrate that because of this several miscarriages of justice can occur. In addition, this chapter also aims to address the impact that

[1] E Murphy 'The art in the science of DNA: A laypersons guide to the subjectivity inherent in forensic DNA typing' (2008) 58 (2) *Emory Law Journal* at 495.
[2] JA Goodwin & L Meintjes-Van der Walt 'The use of DNA evidence in South Africa: Powerful tool or prone to pitfalls' (1997) 114(1) *South African Law Journal* at 158.
[3] Murphy (n1) at 490.
[4] Goodwin & Meintjes-Van der Walt (n2) at 158.
[5] Murphy (n1) at 497.
[6] L Meintjes-Van der Walt & P Dhliwayo 'DNA evidence as the basis for a conviction' (2021) 24 *Potchefstroom Electronic Law Journal* at 9. Also see KC Boies 'Misuse of DNA evidence is not always a harmless error: DNA evidence, prosecutorial misconduct, and wrongful convictions' (2011) 17(4) *Texas Wesleyan Law Review* at 407.
[7] Boies (n6) at 436.

competent legal representation has concerning DNA evidence and whether a conviction based solely on DNA evidence should be allowed considering all the shortcomings of DNA evidence and DNA samples.

4.2 DNA profiling techniques

4.2.1 Restriction Fragment Length Polymorphisms (RFLP)

This technique was the very first DNA profiling technique introduced in 1986 and it was developed to quantify the length of specific DNA strand segments that are known as variable number tandem repeats (VNTRs).[8] This DNA profiling technique is currently no longer relevant in DNA profiling due to technological advances.[9] The restriction enzyme utilised in this method is used to cleave the specific DNA areas around the VNTRs.[10] The DNA is initially isolated and then purified in the RFLP process.[11] This technique involves cutting the DNA strands to the desired length using restriction chemicals, isolating DNA sections through gel mediums in accordance with their sizes, moving the sections onto strong backings, hybridising the specific DNA pieces with reciprocal DNA pieces and taking pictures or impressions of the ideal sections.[12]

This method was not only time-consuming, taking several weeks to complete, but another disadvantage was that it required a much larger DNA sample than the new techniques and it could not be utilised to analyse degraded samples.[13] As a result, this method was replaced by Polymerase Chain Reaction (PCR) techniques.

4.2.2 Polymerase Chain Reaction (PCR)

PCR refers to an amplification technique that was previously utilised only in situations where the DNA sample was either too small or if the sample had started degrading due to various factors.[14] However, nowadays this method is used regardless of the condition of the sample and now forms an integral part of targeting the particular short

[8] Murphy (n1) at 494.
[9] L Meintjes-Van der Walt 'An overview of the use of DNA evidence in South African criminal courts' (2008) 1 *South African Journal of Criminal Justice* at 40.
[10] HR Dash & others *Handbook of DNA profiling* (2022) at 121.
[11] Dash (n10) at 121.
[12] Dash (n10) at 121.
[13] Dash (n10) at 125-130 and Boies (n6) at 410.
[14] L Meintjes-Van der Walt *DNA in the courtroom: Principles and practices* (2010) at 37. A sample can degrade due to weather conditions, time, UV lights and chemicals.

tandem repeats (STRs).[15] This technique has the special benefit of allowing the use of extremely small amounts of DNA from virtually any biological tissue as well as particularly damaged genetic material.[16] Under this technique, a particular DNA region (*loci*) which differs in size between individuals, is copied several times.[17] This technique mimics the process that occurs when DNA is replicated before cell division in the body.[18] Each cell in the body has a complete copy of a person's DNA.[19] This technique makes use of three steps. Firstly, the sample must be heated to separate the sample from a double-stranded helix into a separate single strand.[20] Secondly, the primers must be bounded to specific segments of the single-stranded DNA which assists with targeting the specific locus.[21] Lastly, the original DNA sample needs to be duplicated by using the extension of the primers using the original DNA strand.[22]

4.2.3 Short Tandem Repeat (STR)

This technique has become the most widely used technique of DNA profiling and is used worldwide.[23] The term "STR typing" refers to a particular kind of DNA sequence that is targeted during the PCR process.[24] The STRs are a series of bases that are joined one after another in tandem and are repeated several times, hence why they are referred to as "tandem repeats".[25] In South Africa, this technique is used frequently by the South African Police Service Forensic Science Laboratory by making use of the AmpFISTR Profiler Plus PCR Amplification kit.[26] In South Africa, a 10-*locus* STR system is used, meaning that the AmpFISTR Profiler Plus kit analyses 10 different places on a person's DNA sample to create an STR profile.[27] The 10th *locus* indicates the gender of the individual.[28] In the United States of America (USA), a 13-*locus* STR

[15] Meintjes-Van der Walt (n14) at 37 and Meintjes-Van der Walt (n9) at 29.
[16] Goodwin & Meintjes-Van der Walt (n2) at 154. Also see S de Wet & others 'DNA profiling and the law in South Africa' (2011) 14(4) *Potchefstroom Electronic Law Journal* at 177.
[17] De Wet (n16) at 176.
[18] Meintjes-Van der Walt (n9) at 29 and Meintjes-Van der Walt (n14) at 37.
[19] Meintjes-Van der Walt (n9) at 29 and Meintjes-Van der Walt (n14) at 37.
[20] De Wet (n16) at 176 and Meintjes-Van der Walt (n9) at 29-30 and (n14) at 38.
[21] De Wet (n16) at 176 and Meintjes-Van der Walt (n9) at 29-30 and (n14) at 38.
[22] De Wet (n16) at 176 and Meintjes-Van der Walt (n9) at 29-30 and (n14) at 38.
[23] Meintjes-Van der Walt (n14) at 12 & 41. See also Meintjes-Van der Walt & Dhliwayo (n6) at 3
[24] Meintjes-Van der Walt (n9) at 31.
[25] Meintjes-Van der Walt (n9) at 31 and Meintjes-Van der Walt (n14) at 41, De Wet (n16) at 178 and EC Lubaale 'Bokolo v S 2014 (1) SACR 66 (SCA): The practicality of challenging DNA evidence in court' (2015) 52 *SA Crime Quarterly* at 40.
[26] Meintjes-Van der Walt (n14) at 32 and 43.
[27] Meintjes-Van der Walt (n14) at 43 and Meintjes-Van der Walt (n9) at 34 and De Wet (n16) at 178.
[28] De Wet (n16) at 179.

system is used.[29] In a multiplex PCR technique, the levels of discrimination rise dramatically when a second or third *locus* is employed, therefore, the study will have greater discriminating power and a more unique STR profile the more STR *loci* it includes.[30]

The technique is advantageous as it enables DNA typing to be performed with very small amounts of DNA from practically any nuclei-containing tissue as well as genetic material that is too old or has been exposed.[31] Moreover, the probabilities of human error are much lower regarding the analysis and interpretation of forensic science evidence.[32] The reason behind this is that the software that is used increases the number of controls and internal checks.[33] In addition, this technique is more sensitive than the previous DNA analysis techniques.[34] Another advantage is that any data that is produced with this method can be digitally saved for future use and re-analysis.[35]

Evidence that a person's STR profile matches one of the samples collected at the scene of the crime just identifies and places that individual there, a matched profile cannot be used to conclusively determine whether or not that person is the criminal.[36]

4.3 Shortcomings of DNA evidence

4.3.1 Contamination

A DNA sample could get contaminated with foreign DNA at any point in time during the process.[37] Samples that remain at the crime scene for a period of time ranging from a few hours to a few weeks may be contaminated as a result of unintentional contact with another DNA source.[38] In addition, the negligent gathering of evidence by law enforcement officers and the improper sample handling by lab staff may lead to contamination or sample switching.[39] This is why it is imperative to follow a specific process when handling forensic evidentiary material to prevent accidental

[29] Murphy (n1) at 495 and Meintjes-Van der Walt (n14) at 44.
[30] Meintjes-Van der Walt (n9) at 32.
[31] Meintjes-Van der Walt (n9) at 32 and Meintjes-Van der Walt (n14) at 42.
[32] (n31).
[33] (n31).
[34] (n31).
[35] (n31).
[36] Lubaale (n25) at 40.
[37] Goodwin & Meintjes-Van der Walt (n2) at 158 and De Wet (n16) at 181.
[38] (n37).
[39] Goodwin & Meintjes-Van der Walt (n2) at 159.

contamination.[40] To lessen the possibility of contamination or degradation due to improper handling, those involved in specimen collection should have a basic grasp of the analysis that will be performed.[41]

When dealing with contamination, it is important to also take note of background DNA.[42] The background DNA distribution that pre-dated the crime event serves as the "natural environment" of the crime scene.[43] The goal of the investigation is to distinguish between the DNA distributions that are imposed by the crime-scene event itself and those that are part of the "natural environment".[44] In addition to the difficulties caused by "background contamination," the investigators and forensic field workers may also contaminate the crime scene.[45] This is known as "investigator-mediated contamination".[46] Unlike background contamination, investigator-mediated contamination is theoretically avoidable, however, it is challenging to exclude such a possibility in practice.[47]

Due to its sensitivity, DNA profiling is sensitive to contamination from a variety of sources which can negatively impact the results of the profile.[48] Forensic field workers and scientists must take precautions to avoid contamination during the collection and analysis of the sample since PCR amplification is extremely sensitive to even tiny amounts of DNA.[49] There are a few guidelines that have been laid down regarding the collection of samples in order to minimise the possibility of contamination:[50]

a) Gloves should always be used when handling samples and must be changed between samples to prevent cross-contamination
b) Blood samples or buccal swabs must be of a high enough standard to support repeat testing

[40] Goodwin & Meintjes-Van der Walt (n2) at 159.
[41] (n40).
[42] P Gill 'Misleading DNA evidence: Reasons for miscarriages of justice' (2012) 10 *International Commentary of Evidence* at 56. And L Meintjes-Van der Walt 'The reliability of trace DNA or Low Copy Number (LCN) DNA evidence in court proceedings' (2021) 46(1) *Journal for Judicial Science* at 9.
[43] Gill (n42) at 60.
[44] Gill (n42) at 60.
[45] Gill (n42) at 60.
[46] Gill (n42) at 60.
[47] Gill (n42) at 61.
[48] De Wet (n16) at 180 and Meintjes-Van der Walt (n42) at 8-9.
[49] De Wet (n16) at 180.
[50] De Wet (n16) 181.

c) Samples must be stored as quickly as possible in clearly marked and air-tight containers
d) Bloody or semen-stained towels or swabs should be completely air-dried before being stored
e) Following collection, swabs should be sent right away to the forensic lab where suitable storage is available.

4.3.2 Degradation

It is inevitable that samples exposed at the crime scene will deteriorate.[51] After a cell dies, nuclease activity begins, and the DNA is quickly broken down.[52] DNA samples can deteriorate as a result of heat, humidity, time, UV light and different chemicals.[53] Different tissues will degrade at different rates.[54] For instance, DNA protected within the root of a hair is more resistant to deterioration than DNA found in tiny patches of exposed blood.[55] Therefore, gathering evidence quickly and storing it properly afterwards is a way to minimise degradation.[56] Although degradation can limit the usefulness of DNA typing, it does not automatically invalidate it.[57] When DNA degradation is present at very high levels, it can make it difficult to successfully identify the samples and as a result, STRs may only give a partial or produce no DNA profile at all from such materials.[58]

4.3.3 Laboratory Errors

There is always a chance of human error when tests are conducted by humans and DNA evidence should not be interpreted without considering the possibility of human error.[59] DNA testing requires the use of precise technology, and the accurate calibration of equipment is essential for assuring reliable outcomes.[60] Furthermore, the utilisation of properly trained workers in forensic DNA testing is arguably the most crucial factor.[61] It is without a doubt that the steps involved in DNA profiling are well

[51] Goodwin & Meintjes-Van der Walt (n2) at 159.
[52] Goodwin & Meintjes-Van der Walt (n2) at 159 and De Wet (n16) at 182.
[53] Meintjes-Van der Walt (n9) at 40.
[54] Goodwin & Meintjes-Van der Walt (n2) at 159 and De Wet (n16) at 182.
[55] (n54).
[56] (n54).
[57] Meintjes-Van der Walt (n9) at 41.
[58] Meintjes-Van der Walt (n9) at 40 and
[59] NR Behrouzfard 'Strengths, limitations and controversies of DNA evidence' (2006) 1 *Southern New England Roundtable Symposium* at 128.
[60] Goodwin & Meintjes-Van der Walt (n2) at 163.
[61] (n60).

within a laboratory technician's skills.[62] The majority of mistakes discovered in crime labs were caused by the most common issue regarding cross-contamination by microscopic residues of irrelevant material due to sloppy work or when scientists unintentionally contaminate the samples with their own DNA.[63] In addition, critics are concerned that inexperienced lab technicians, lax laboratory staff standards and scientists purposefully manipulating results to deceive the presiding officer, give rise to false matches and potential errors.[64] In *S v Maqhina*,[65] the court pointed out several errors regarding the DNA evidence that was produced. Firstly, the expert in the laboratory did not follow the appropriate standard protocol.[66] Secondly, the scientist performing the test was not qualified, thirdly, the defence expert claimed that the failure of the forensic science laboratory expert to conduct several duplicate tests rendered it impossible to assess the reliability of the test and lastly, the laboratory was not accredited.[67]

4.4 The effect of competent and effective legal representation where forensic evidence is concerned

The lack of knowledge among lawyers regarding the use of DNA evidence is one of the issues raised regarding the presentation of scientific evidence in court.[68] Section 35 of the Constitution of the Republic of South Africa states that "every accused person has the right to a fair trial which includes the right to choose and be represented by a legal practitioner, and to be informed of this right promptly."[69] This right plays a significant role in access to justice; however, this right would be meaningless if it did not protect the right to competent and ethical legal representation.[70] In *S v Tandwa and Others*,[71] the court held that the right to legal representation meant a right to legal representation that was not only competent but also of a quality nature to ensure a fair

[62] (n60).
[63] Behrouzfard (n59) at 130.
[64] Behrouzfard (n59) at 131.
[65] *S v Maqhina* 2001 (1) SACR 241 (T).
[66] *S v Maqhina* 2001 (1) SACR 241 (T) para 250F.
[67] *S v Maqhina* 2001 (1) SACR 241 (T) para 251 C-D. Also see L Meintjes-Van der Walt 'Dealing with DNA evidence: S v Maqhina 2001 (1) SACR 241 (T)' (2001) 14 *South African Journal of Criminal Justice* at 380.
[68] Boies (n6) at 439.
[69] The Constitution of the Republic of South Africa 1996 sec 35(3)(f).
[70] JJ Joubert (ed.) *Criminal Procedure Handbook* (2017) at 101.
[71] *S v Tandwa and Others* 2008 (1) SACR 613 (SCA).

trial.[72] One of the fundamental liberties upheld by the US Constitution is the right to legal counsel during a criminal trial.[73] The Sixth Amendment states that "in all criminal prosecutions, the accused shall enjoy the right to a speedy and public trial…..and to have the assistance of counsel for his defense."[74] In *Gideon v Wainwright*, the United States Supreme Court was able to deduce a right to legal representation in all criminal matters by interepreting this right in conjunction with the distinct constitutional right to due process in the Fourteenth Amendment.[75] In addition, the court held that the Sixth Amendments guarantee of legal representation is a fundamental right that is essential to a fair trial.[76] Legal practitioners are expected to possess special knowledge, skill and learning and must measure up to the standard of competence of a reasonable man professing such knowledge and skill.[77] Although it is not expected for legal practitioners to know everything and to be an expert in all fields of the law, the practitioners should however be aware and knowledgeable of the basic frameworks and laws that apply to the case at hand.[78] As science and technology develop, it becomes more difficult for lawyers to effectively apply this information and knowledge to legal decision-making.[79] Therefore, lawyers need to have a greater comprehension of scientific evidence to try criminal cases as DNA evidence is powerful and frequently used.[80] Without at least a basic level of scientific expertise, the assistance of one's own forensic experts or the acquisition and introduction of DNA evidence on behalf of the accused, makes it unnecessarily challenging in order to adduce and challenge scientific evidence in the courtroom.[81]

While prosecutors benefit from working in conjunction with forensic scientists and investigating officers during the pre-trial and investigative phases, defence attorneys

[72] *S v Tandwa and Others* 2008 (1) SACR 613 (SCA) para 7. RK Moletsane 'Access to justice: The right to adequate legal representation in criminal proceedings' LLB thesis, University of the Free State (2021) at 10.
[73] Unknown 'The right to an attorney in a criminal case' (2022) https://www.justia.com/criminal/procedure/miranda-rights/right-to-attorney/ (accessed on 03 November 2022).
[74] United States Constitution, Sixth Amendment.
[75] *Gideon v Wainwright* 372 U.S. 355 (1963).
[76] *Gideon v Wainwright* 372 U.S. 355 (1963).
[77] Mohamed (ed.) *Clinical Law in South Africa* (2016) at 36. Moletsane (n72) at 9.
[78] Joubert (n70) at 102. Moletsane (n72) at 9.
[79] L Meintjes-Van der Walt 'Science Friction: The nature of expert evidence in general and the scientific evidence in particular' (2000) 117(4) *South African Law Journal* at 771.
[80] Boies (n6) at 439.
[81] J Visser 'Defence challenges of forensic scientific evidence in criminal proceedings in South Africa' (2015) 28(1) *South African Journal of Criminal Justice* at 34.

are forced to rely solely on their own skill, knowledge and experience when building a case for the accused.[82] Moreover, according to an analysis of the criminal process in South Africa, the state has typically presented forensic science evidence without any resistance from the defence attorneys.[83] This is mainly because legal counsel is frequently constrained by budgetary and time constraints and challenges based on the validity of the science and the interpretation of results are uncommon.[84]

4.5 DNA evidence as the sole basis for a conviction

Exonerations of people who have been wrongfully convicted are becoming more common.[85] While there is no exact number of wrongful convictions in South Africa, in the USA it has been estimated that wrongful convictions range from about 0.5-5% or more, resulting in thousands to ten thousand of wrongful convictions each year.[86] The extensive use of DNA evidence is one factor cited as contributing to the high frequency of wrongful convictions in both South Africa and the USA.[87] The same science that is enabling the exonerations may have contributed to the original conviction.[88] In South Africa, the improper handling of DNA evidence and the lack of forensic evidence and expert testimony has been cited as some of the leading causes of wrongful convictions.[89] In the USA, forensic evidence and expert testimony (unreliable or invalid forensic science), has also played a role in the number of wrongful convictions.[90] The Innocence Project in the USA discovered that of the first 325 DNA exonerations, 47% of those were a result of forensic errors.[91] Some of these wrongful convictions based on DNA evidence are linked to the shortcomings of DNA evidence such as contamination, mixing of samples, faulty analysis and biased interpretation.[92] It can be

[82] Visser (n81) at 29-30.
[83] Visser (n81) at 25.
[84] Visser (n81) at 25.
[85] Boies (n6) at 435.
[86] E Schapiro 'Wrongful convictions: Not just an America phenomenon? An investigation into the cause of wrongful convictions in the United States, Germany, Italy and Japan' (2020) 34(3) *Emory International Law Review* at 897.
[87] Boies (n6) at 435.
[88] Boies (n6) at 435.
[89] T Shumba 'Litigating innocence: The problem of wrongful convictions and the absence of effective post conviction remedies in South Africa' (2017) 30(2) *South African Journal of Criminal Justice* at 184.
[90] Schapiro (n86) at 905. Also see JG Bell & others 'Causes of wrongful convictions: Looking at student knowledge' (2008) 19(1) *Journal of Criminal Justice Education* at 4.
[91] RJ Norris & others 'Thirty years of innocence: Wrongful convictions and exonerations in the United States, 1989-2018' (2020) 1 *Wrongful Convictions Law Review* at 11. 91% of the cases identified by the Innocence Project were sexual assault cases which often have DNA evidence to test.
[92] Boies (n6) at 435.

prejudicial to convict an accused person exclusively only on DNA evidence.[93] It is difficult to determine that the accused is the real offender in the absence of other evidence, particularly in cold hit cases, thus relying solely on DNA evidence for a conviction might lead to wrongful convictions.[94] Moreover, as the DNA database expands the likelihood of false-positive matches rises.[95]

Despite all of this, a conviction based solely on DNA evidence is not officially prohibited in South Africa.[96] Case law has demonstrated that if DNA evidence is relevant, admissible, and reliable under the particular facts of the case, a court may find an accused guilty solely based on DNA evidence.[97] However, courts need to bare in mind that the estimated statistic does not represent the likelihood that the accused committed the crime.[98] It is merely an estimation of the likelihood that unrelated members of the suspect's population contributed to the DNA evidence.[99] A DNA match or link only suggests that the accused may be the perpetrator.[100] In the USA, convictions based solely on a single piece of evidence do happen occasionally as the law regrettably enables it.[101] Numerous inmates who were falsely convicted were unfortunately convicted as a result of a single piece of evidence.[102] Additionally, it is quite likely that this one piece of evidence will be incorrectly relied upon if it is considered to be strong, such as DNA evidence or a fingerprint match.[103] Although the additional testing of DNA samples could prevent laboratory errors and wrongful convictions, it does not completely eradicate the possibility of error.[104] As a result DNA evidence should not be the sole reason behind a conviction, especially taking into account the number of wrongful convictions that have occurred as a result of DNA evidence.

[93] Meintjes-Van der Walt & Dhliwayo (n6) at 24.
[94] Meintjes-Van der Walt & Dhliwayo (n6) at 24.
[95] Meintjes-Van der Walt & Dhliwayo (n6) at 24.
[96] Meintjes-Van der Walt & Dhliwayo (n6) at 26.
[97] Meintjes-Van der Walt & Dhliwayo (n6) at 26.
[98] Meintjes-Van der Walt & Dhliwayo (n6) at 26.
[99] Meintjes-Van der Walt & Dhliwayo (n6) at 26.
[100] Meintjes-Van der Walt & Dhliwayo (n6) at 26.
[101] B Sangero & M Halpert 'Why a conviction should not be based on a single piece of evidence: A proposal for reform' (2007) 48 *Jurimetrics* at 62.
[102] Sangero & Halpert (n101) at 62.
[103] Sangero & Halpert (n101) at 63.
[104] Sangero & Halpert (n101) at 78.

4.6 Conclusion

Although a number of DNA profiling techniques have been developed throughout the years, these DNA profiling techniques might find it hard to produce accurate results due to contamination, degradation, lab errors and forensic field workers. Although some of these errors are avoidable, the possibility of human error is inevitable. Legal practitioners can also contribute to the errors of DNA evidence when presenting DNA evidence in court, this is why it is imperative that they stay abreast of the latest developments in forensic evidence and have a basic knowledge of such evidence. It is without a doubt that these errors may lead to wrongful convictions if they are not taken into account, this is why it is advisable that convictions should not be based solely on DNA evidence and instead, other forms of evidence should be available.

CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

5.1. Introduction

> "The work we do as forensic scientists and the conclusions we reach have lasting effects on people's lives, so we must pursue every effort to understand and identify our weaknesses."[1]

The main objective of the criminal justice system is to ensure that criminals are properly punished.[2] Forensic science has grown to become crucial in criminal investigations and prosecutions in identifying the guilty.[3] People are being found guilty in an increasing number of cases based only on forensic evidence, however, some of these convictions have been revealed to be incorrect, mostly as a result of the forensic science techniques' inadequate scientific validation.[4] Regardless of this, some courts continue to accept forensic expert testimony based on pattern-matching techniques as scientific evidence in spite of the faults.[5]

5.2. Summary of chapters

It is without a doubt that DNA evidence plays a major role in criminal proceedings and access to justice, be that as it may, DNA evidence has been severely scrutinized not only by the scientific community but by lawyers and judges as well.[6] There are several factors that ought to be considered when dealing with DNA evidence such as the rules of admissibility, the chain of evidence, the pre-trial disclosure of evidence as well as the evaluation of the evidence and the shortcoming of DNA evidence that will ultimately contribute to the weight that is attached to the DNA evidence. Relevancy is the cornerstone of the admissibility of any type of evidence in South Africa and in the United States of America (USA). In South Africa apart from relevancy, DNA evidence will not be admissible if it has been obtained in breach of the Constitution of the Republic of South Africa.[7] Apart from these two factors, DNA evidence will not be

[1] G Laporte 'Wrongful convictions and DNA exonerations: Understanding the role of forensic science' (2018) 279 *National Institute of Justice* at 2.
[2] A Obaborede & L Meintjes-Van der Walt 'The dangers of convictions based on a single piece of forensic evidence' (2020) 23 *Potchefstroom Electronic Law Journal* at 2.
[3] Obaborede & Meintjes-Van der Walt (n2) at 2.
[4] Obaborede & Meintjes-Van der Walt (n2) at 2.
[5] Obaborede & Meintjes-Van der Walt (n2) at 26.
[6] L Meintjes-Van der Walt 'An overview of the use of DNA evidence in South African criminal courts' (2008) 21(1) *South African Journal of Criminal Justice* at 58.
[7] The Constitution of the Republic of South Africa, 1996 sec 35(5).

excluded for any other reasons. In the USA, in addition to relevancy, there is also a specific set of rules that are contained in the Federal Rules of Evidence, Rule 702, that were developed in *Daubert v Merell Dow Pharmaceuticals* regarding the admissibility of scientific evidence in court proceedings.

As discussed in chapters 2 and 3, the chain of evidence is an important factor when dealing with DNA evidence as will determine the amount of weight that the court will attach to the specific DNA evidence that is presented in court. Another factor that is key is the pre-trial disclosure of evidence. This remains a key component in the search for the truth and it further minimises potential miscarriages of justice and gives the accused adequate time to prepare for their defence.

As scientific evidence keeps evolving and new DNA profiling techniques are developed and new methods are introduced, further questions are raised regarding the validity of scientific evidence in the courtroom.[8] Furthermore, this raises the question as to what specific procedures should be put in place regarding the testing of DNA samples and the manner in which DNA evidence is presented in court.[9] Despite all the shortcomings of DNA evidence, the courts have widely accepted DNA profiling as being extremely reliable.[10] Although these shortcomings of DNA evidence may be prevented by following a strict chain of evidence and laboratory requirements, we should not be oblivious to the effects of human error, poor forensic training of field workers and unethical behaviour. In addition, although the South African National Accreditation System has provided several guidelines that should be used and followed in laboratories when handling DNA samples to avoid contamination and further degradation, however, these guidelines do not fully diminish the possibility of human error during the handling of the sample, nor does it address the unethical behaviour of individuals.

Due to these reasons, it is clear that securing a conviction based solely on DNA evidence should be avoided as several things could go wrong during the collection, sealing, storing and testing of the DNA sample. Furthermore, in accordance with the study, courts should always bear in mind that a DNA match simply means that the accused might be the perpetrator, however, it does not confirm anything and as a

[8] Meintjes-Van der Walt (n6) at 58-59.
[9] Meintjes-Van der Walt (n6) at 58.
[10] Meintjes-Van der Walt (n6) at 39.

result, the court will need to rely on other evidence in order to confirm that the person is indeed the perpetrator. Furthermore, it is the same science that is enabling exonerations that may have contributed to the original convictions.[11] Some initial wrongful convictions were reached using scientific evidence and DNA evidence has been demonstrated to produce false factual conclusions in the past.[12]

To successfully be able to challenge and adduce DNA evidence in courts, legal practitioners need to be aware of the potential defences that DNA evidence may face, as well as the merits of these arguments.[13] It is doubtful that a defence attorney or advocate will recognise the best strategies to use against the state's evidence if he or she has no familiarity with or comprehension of forensic scientific evidence.[14] Moreover, it is improbable that the defence will be able to locate any private scientist who meets the requirements for a trained, competent and experienced expert witness in terms of forensic evidence, therefore, it is important that legal practitioners are aware of the veracity of any scientific data that is cited in court.[15]

5.3. Recommendations

Regarding the pre-trial disclosure of evidence in criminal proceedings in South Africa, it is recommended that a specific set of rules should be codified for purposes of discovery similar to the position in the USA. It should be content-specific as to what can be disclosed by the prosecution and under which circumstances, and what cannot be disclosed and why. The rules, or at the very least practice directives, should also contain reference to the instances when the defence has no obligation to reciprocate. Regarding DNA testing reports and results, although the defence has no reciprocal duty to disclose anything to the prosecution, it is submitted that these reports should be disclosed to the prosecution as it is crucial for both the State and the accused to have ample time to prepare and to consult with experts. Furthermore, it will assist in enabling both parties to be able to scrutinise the chain of evidence in order to come up with a proper defence. In addition, the right to a fair trial may be hindered if parties

[11] KC Boies 'Misuse of DNA evidence is not always a harmless error: DNA evidence, prosecutorial misconduct and wrongful convictions' (2011) 17(4) *Texas Wesleyan Law Review* at 435.
[12] Boies (n11) at 435.
[13] Meintjes-Van der Walt (n6) at 39.
[14] J Visser 'Defence challenges of forensic scientific evidence in criminal proceedings in South Africa' (2015) 28(1) *South African Journal of Criminal Justice* at 30.
[15] Visser (n14) at 30.

(whether the State or the accused) need to continuously request postponements to properly prepare if the evidence is not discovered before the trial.

Regarding the right to effective and competent legal representation as discussed in Chapter 4, it is submitted that legal practitioners and presiding officers (judges and magistrates) ought to be educated about the developments of DNA evidence as it evolves. Judges and legal practitioners will be assisted in continuing education in the development of new and improved standards for evaluating the validity and probative value of DNA evidence in criminal proceedings. The training of legal practitioners and judges should be made compulsory as the use of DNA has become an invaluable tool in the pursuit of justice. In the USA, states and local bar associations have established Continuing Legal Education workshops which must be attended by lawyers should they wish to remain active in the legal profession.[16] If something similar can be established in South Africa, the main purpose would not be to make legal practitioners and judge's amateur scientists, but rather to maximise competent and effective legal representation and access to justice.

Furthermore, as science evolves, the need to use expert witnesses increases. As discussed in the study, defence lawyers face the challenge of budgetary constraints and usually cannot afford to employ or make use of experts in certain situations as experts are costly, while the prosecution enjoys the benefit of working with both forensic scientists and investigating officers. Defence lawyers should also be given the opportunity to consult with forensic experts provided by the state should they be faced with budgetary constraints and the law firm cannot afford it. This will level the field and maximise access to justice by ensuring that both parties have all the resources that they need to carry out their services to the best of their ability. It is submitted that it would be best to follow the position of the USA and call the experts to the stand instead of providing an affidavit as *prima facie* proof as discussed in Chapter 2. Calling expert witnesses to the stand provides a better opportunity to challenge the reliability of evidence. Furthermore, South Africa should consider adopting the statutory requirements of Rule 702 of the Federal Rules of Evidence regarding the testimony of expert witnesses. These requirements will assist in strengthening expert witness testimonies.

[16] Boies (n11) at 439.

Regarding convictions based solely on DNA evidence as discussed it Chapter 4, it is submitted that convictions based solely on DNA evidence should not be permitted at all. Based on the results of the research, it is clear that there are various amounts of errors that can occur when handling or dealing with DNA evidence. Despite the DNA profiling techniques, the admissibility rules and laboratory standards that are in place, it is without a doubt that the possibility of error can be avoided, however, when dealing with DNA evidence, the possibility of human error is inevitable. Furthermore, the study has shown that forensic DNA evidence is responsible for quite a large number of wrongful convictions as a result, judges and legal practitioners should refrain from thinking that DNA evidence is an absolute science that is immune to error.

In conclusion, it is without a doubt that the use of DNA evidence has become prevalent in ensuring access to justice and that it has become a vital tool in criminal proceedings. It is indeed worthy of the praise it receives; however, one should not be blind to the numerous shortcomings that may occur when dealing with DNA evidence in criminal proceedings. From the chain of evidence, pre-trial disclosure of evidence, the evaluation of evidence, DNA profiling techniques, contamination, degradation, laboratory errors, inadequate legal representation and the substandard presentation of forensic DNA evidence in criminal proceedings, the room for error is indeed large. It is therefore important that when dealing with DNA evidence, these shortcomings should be taken into account to maximise access to justice, while ensuring the right to a fair trial and minimising wrongful convictions as a result of DNA evidence.

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