DNA PROFILING AS A MEANS OF ESTABLISHING PATERNITY IN SOUTH AFRICAN LAW

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PREFACE

In undertaking a comprehensive research project, such as this, I have come to realise that the researcher is but one cog in a mighty wheel. There are a number of other persons to whom I owe a debt of gratitude for assisting me, supporting me and sharing with me their invaluable expertise and skills. I wish to place on record my appreciation to all the people who have helped me to realise my goal.

Especially, however, I note my gratitude and sincere thanks to my colleague and supervisor, Professor F.N. Zaal, for the helpful comments, suggestions and guidance which I have so generously received from him.

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All the information contained in this document is pertinent up to the date of publication - January 1994.

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'... the presumption of legitimacy has been withering and shrinking in the face of scientific evidence. ... Assumptions are looked upon ... as the bats of the law flitting in the twilight, but disappearing in the sunshine of actual facts ...'

DEAN HENRY J. WIGMORE

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INTRODUCTION

The pathetic cry 'Who is my father?' has been asked time and again the world over. Discovery of paternity, linked as it is with the processes - legal and scientific - of establishing the alleged father's relationship on a balance of probabilities is a very real problem in the field of family law in South Africa. Blood tests have proved to be one aid in its solution. However, the application of such tests carry with them their own specific difficulties, most notable from the point of view of the lawyer is the extent of the authority of the court to order such tests, the interpretation of the test results and the role and emphasis that should be given to the results of the blood tests in the final determination of each case. Lawyers have to be wary and avoid falling into the trap of the layman who has the distinct tendency to accept unquestionably anything backed by scientific authority. The uncertainties surrounding paternity determinations have been further exacerbated by the fact that the law does not always regard the biological father of a child as the legal father. In cases of artificial insemination the biological mother or father (as the case may be) will not necessarily be recognised as the legal parent of the offspring in question, even in the absence of any formal adoption by the other parent.[1]

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[1] Section 5 Children Status Act 82 of 1987.
Note: Section 5 (3) For the purposes of this section **'artificial insemination'**, in relation to a woman-
(a) means the introduction by other than natural means of a male gamete or gametes into the internal reproductive organs of that woman; or
(b) means the placing of the product of a union of

In civil matters, where the determination of paternity of a minor falls upon the shoulders of the court, whether the court may order the removal of blood samples from any person alleged to be the father of the child in question, or from the child himself (or herself) remains a vexed issue.[2] In view of the series of controversial, yet each well-considered, judgments of recent years, the answer continues to be swamped in the quagmire of uncertainty. Until it is adjudicated by the Appellate Division or legislation is introduced, specifically and explicitly establishing the parameters of the courts authority, the questions surrounding the power ofa court to compel any person to submit to blood tests will remain controversial. Unfortunately, the latest parliamentary enactment on the subject, namely section 2 of the Children's Status Act 82 of 1987, offers no resolution to the problem. Its effect, quite simply, is to provide a purely evidentiary rule rather than a legal rule.

The current worldwide emphasis on the rights of children carries with it a concomitant interest in the field of paternity determination, particularly scientific and legal methods of establishing patermal relationships (or the lack thereof). The discovery of a technique known as DNA profiling, by Sir Alec Jeffreys, in 1985, demonstrates enormous potential in this area.

> a male and a female gamete or gametes which have been brought together outside the human body in the womb of that woman,
> for the purposes of human reproduction, ...

[2] See Seetal v Pravitha and Another NO 1983 (3) SA 827(D); M v R 1989 (1) SA 416(O); Nell v Nell 1990 (3) SA 889(T); S v L 1992 (3) SA 713(C); and O v O 1992 (4) SA 137(C).

It has repeatedly been shown that a study of the tandem repeated 'minisatellite' regions identified on the DNA strand will prove to be of considerably superior probative value in paternity disputes (as opposed to the earlier conventional tests which use markers from blood and serum proteins).

Specifically with regad to paternity disputes, existing investigative techniques such as blood group analyses, demonstrate both qualitative, as well as quantitative, drawbacks when compared with DNA profiling. A putative father in a paternity conflictcan often be excluded on the basis of blood group analysis, but can only be positively identified in exceptional circumstances.

The strength of the DNA profile tests rests on the intrinsic properties of deoxyribonucleic acid (DNA), the so-called building blocks of chromosomes. Each individual, except for identical twins, possess a unique DNA pattern (or profile). This quality of individuality enables scientists to use the DNA profile tests to positively select out and identify individuals.

It must be noted that even the DNA profile tests produce evidence of a relationship or non-relationship based on probabilities. However, when properly conducted these "probabilities" can be so phenomenally high that it has been suggested that in disputed parentage cases, DNA profiles have the capacity to yield an absolute certainty, rather than merely a probability, of

paternity. Cellmark Diagnostics (one of the laboratories in the United States conducting DNA profiling on a commercial basis) estimate that under ideal conditions the likelihood of a coincidental match between two samples taken from different persons is less than one in thirty billion (or, alternately stated, one in five to six times the present population of the earth). Claims to the contrary are exiguous and may, therefore, quite reasonably conclude that the potential for identification and linking genetic relationships, contained in the DNA profile process, is unrivalled. No other blood or serum test rivals the accuracy of DNA profiling. The DNA commission of the Society of Forensic Haemogenetics report of 1991 clearly states that paternity testing with conventional techniques is a trite procedure for producing evidence in court cases, and can continue to be used either alone or in combination with determination of DNA polymorphisms. They also stated, however, that provided a DNA system has been suitably and adequately scrutinized, they see no reason why DNA profiling cannot be used alone.

DNA profiling offers the judicial system a powerful tool for tracing paternity and it is the considered beliefof the author that it has the absolute potential to revolutionise law enforcement in this field of the law.

This study sets out, in **Chapter One**, to familiarise the reader with the fundamental common law rules regarding the assessment of paternity in South Africa, especially when there is a dispute. The author has also included, at this juncture, a review of how

these standards have been applied by the courts. In **Chapter Two**, the researcher examines the conventional tests being utilised in South Africa in paternity determination cases and includes a discussion on the limitations and inherent problems. **Chapter Three** introduces the reader to the actual process of DNA profiling. DNA profiling may hardly be described as a common procedure. The actual scientific process is extremely complex and is performed by specicically trained molecular biologists. In Chapter Three there is an attempt to simplify the procedure so that the reader may become familiar with and consequently, fully comprehend the efficacy of DNA profiling as a method for identification. The author has sought further to demonstrate the accuracy of identifications made utilising DNA profiling and, as a result, the extended parameters of its value in the legal field, particularly in matters of paternity disputes. (The reader's attention is drawn to the fact that all diagrams in Chapter Three are the individual work of the author.) In the next chapter, **Chapter Four**, a detailed examination is made of the practical value and application of DNA profiling. The author then draws her conclusions, discussing why the DNA profile test is in fact, and will also in law prove to be, superior to the conventional methods of testing. That there are potential problems, linked to the very nature of DNA, is the issue under examination in **Chapter Five**. Identification of the problems, their effect on the overall DNA profile result and even (sometimes) their resolution are all issues placed in context and discussed. **Chapter Six** deals with the pivotal issues around which much of the paternity controversy revolves. The researcher

embarks upon an indepth investigation into the South African case law and legislation dealing with the court's authority to compel any person to submit to blood tests. In this regard, the power of the court is examined against the backdrop of 'invasion of privacy' and 'violation of the right against self-incrimination'. Also included in Chapter Six is a short excursus on the attitudes and approaches of two other first world jurisdictions, namely England and the United States of America towards blood testing in paternity disputes. Finally, in **Chapter Seven**, the author considers the testing standards that would have to be met before DNA profiling would be accepted by the courts as being of evidentiary value. The researcher also reflects upon possible guidelines for any court deliberating the acceptability of DNA profile evidence.

The overall impact of this work should leave the reader with an understanding of the problems facing lawyers dealing with paternity contests and the revolutionary effect of DNA profiling in resolving many of these problems. It is hoped that this goal has been satisfied.

CHAPTER ONE

AN OUTLINE OF THE LAW RELATING TO THE ATTRIBUTION OF PATERNITY

INTRODUCTION

The one rule of Nature with which all Mankind is familiar is that an act of intercourse between a Man and a Woman has the potential to engender offspring. Natural reason dictates that, if born, these offspring must also be raised and maintained. But since no one ought, as a rule, to be forced against his will to maintain another's children, where there arises a query with regard to the maintenance of a child, that child must first be recognised as the child and offspring of the alleged father.

1.1 HISTORICAL ANALYSIS OF THE ATTRIBUTION OF PATERNITY

The Roman Law and the Roman-Dutch Law

Roman law understood and accepted that it was, at that time, not possible to give a definite answer to the question of who fathered a child. To avoid undue conflict, the Roman lawyers attributed to the factual existence of a marriage between the parties, the provisional inference that the husband was also the father of all children born

during the subsistence of that marriage.[1]

Spiro believes that the pater est quem nuptiae demonstrant presumption might, in fact, have originally been a praesumptio juris et de jure, that is to say, quite irrebuttable.[2] However, Schorer apparently rejects the view that the presumption would be irrebuttable, intimating that it was probably only a praesumptio juris, that is to say, rebuttable.[3] Similar authority is also to be found in the Digest from which it would appear that this presumption was clearly never intended to be sacrosanct. In Justinian's Digest, it was maintained that provision existed for it to be rebutted by the putative father if he were able to adduce sufficient evidence to support his denial. At 1.6.6. Justinian provides the following example:

> If however we suppose a case where a husband was absent, let us say, 10 years, and, on coming home, found in his house a child one year old, we agree with the opinion of Julianus that the child is not [to be deemed in law] the son of the husband.[4]

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1 Gane P.,ed., THE SELECTIVE VOET: BEING THE COMMENTARY ON THE PANDECTS OF JOHANNES VOET (Durban 1955: Butterworth and Co.) 134-5.

2 Spiro E. 'Legitimate and Illegitimate Children' 1964 ACTA JURIDICA 53, at 57.

3 Maasdorp A.F.S. (translator) THE INTRODUCTION TO DUTCH JURISPRUDENCE OF HUGO GROTIUS WITH AN APPENDIX CONTAINING SELECTIONS FROM THE NOTES OF WILLIAM SCHORER (Cape Town 1903: J.C. Juta and Co.) 393.

4 Monro C.H. (translator) THE DIGEST OF JUSTINIAN (Cambridge 1904: C.J. Clay and Sons) 30.

The duration of pregnancy was of pivotal importance in any attempt to rebut the presumption of pater est quem nuptiae demonstrant, since the only evidence carrying any likelihood of successful acceptance by the tribunals was that of non-access. Grotius attributed to a usual pregnancy a gestation period of seven to eleven months,[5] but Schorer noted that the courts had sometimes even accepted a pregnancy of twelve months if the mother were thought to be a virtuous woman.[6]

With regard to an unmarried woman, the position had, obviously, to be somewhat different as no such presumption could logically apply. According to Grotius, if the alleged father admitted intercourse, the unmarried mother was to be believed in her identification of the father, even though she might have had intercourse with other men, as well.[7] Thus, it would appear that after his admission of having had intercourse with the mother, the indicated man was considered to be the father of the child subsequently born to her. To compound the alleged father's

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[5] Op. cit. Note 3, at 35. At 1.12.3. Grotius noted that all children of a married woman are presumed to be legitimate ... unless there be evidence of absence inconsistent with the period of pregnancy, which is limited to a minimum of seven, and a maximum of eleven months.

[6] Ibid, at 395.

[7] Van der Keesel D.G. VOORLESINGE OOR DIE HEDENDAAGSE REG NA AANLEIDING VAN DE GROOT SE "INLEIDINGE TOT DE HOLLANDSE RECHTSGELEERDHEYD" translated by Gonin H.L. and Pont D. (Cape Town 1967: Gothic Printing Co. Ltd.) 366-7.

plight even further, there appears to be a glaring omission by Grotius on the question of whether or not this presumption could have been rebutted by the putative father. However, one cannot but suggest that, reasonably, rebuttal has to be permitted for it is obvious that this type of paternity by admission is at considerable risk of being contrary to the biological truth.

Similar to what Grotius believed, Groenewegen, when dealing with an unmarried woman, noted that the man was still presumed to be the child's father, irrespective of whether he had admitted to having had sexual intercourse only one month or even one year before the birth.[8] Schorer, however, is highly critical of this approach, calling it unjust, especially, he says, since it continues to apply even where the woman has had intercourse with other men.[9]

Van der Keesel, however, clearly favoured the views expressed by Grotius and Groenewegen, introducing in support of his contention, the idea of the interest of the child. He believed that, in the interests of the child, it would not be unfair to stand by the acceptance of the mother's allegation.[10]

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[8] Groenewegen S. TRACTATUS DE LEGIBUS ABROGATIS ET INUSITATIS IN HOLLANDIA VICINISQUE REGIONIBUS Ad 3.35.8 n (23), as discussed by Thomas Ph. J. 'Paternity: Legal or Biological Concept?' 1988 105 SOUTH AFRICAN LAW JOURNAL 239, at 242.

[9] Op. cit. Note 7 supra.

[10] Ibid.

In his work, CENSURA FORENSIS, at I 1.3.4., Van Leeuwen states that, in issues of paternity, the law draws distinctions among cognates in respect of the father, and a determination of the latter shall be made rather by law than by Nature. We will, therefore, call him the father at whom the law points.[11] Voet, too, acknowledged the possibility of paternity not always being based on biological reality.[12]

It would appear, therefore, that jurists, such as Grotius, Groenewegen and Van der Keesel, acknowledged the best interests of the child as an important criterion for determining paternity when such was in dispute. Clearly, though, other factors, such as gestation period, non-access impotence and sterility, were also deemed relevant. This allegiance, however, must be read in the light of the social and scientific circumstances prevalent at the time. It is trite that no scientific procedure existed which could prove paternity to any level of certainty. Therefore, it is understandable that jurists would prefer to err on the side of safety and security for the new-born child. However, with the great and revolutionary scientific advances of the modern day, specifically the discovery and adoption of the DNA-profile test, the earlier historic approach is clearly archaic.

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[11] Shreiner W.P. (translator) SIMON VAN LEEUWEN'S CENSURA FORENSIS TRANSLATED INTO ENGLISH (J.C. Juta and Co 1883: Cape Town) 35-36.

[12] Op. cit. Note 1 supra, at 137-8.

In his Digest, Voet describes the procedure for the establishment of paternity for the purposes of support of a child as follows: if the man summoned to provide maintenance denied that he was the father of the child, an interim order could nevertheless be made if it appeared likely that he was the father. Thus, the mere admission of intercourse by the alleged father would lead to a provisional order for interim maintenance of the child. The onus of proof would also pass to the man to show that he was, in fact, not the father.[13]

Since direct proof of paternity was not possible, the jurists drew deductions from the proven facts, namely, evidence concerning marriage or sexual intercourse. Consequently, paternity was based on certain presumptions and it appears that the lawyers at the time often assumed that these presumptions were reflective of the biological

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[13] Op. cit. Note 1 supra, at 7, 380-1. He writes: If the man denies intercourse, the onus was on the woman to prove same. It was clearly not sufficient for her to merely name some person as the father - even though she might have done so under oath - the important factor to prove was intercourse.
If the man admitted carnal intercourse but denied that he was the father, credence was given to the woman naming him as the father. This was so even if it could be proved that she had also prostituted herself before with others, or even if the accused raised the defence that he was only intimate with her in the few months prior to the birth. Even the defence that he was not intimate with her unless at a time two whole months before the birth would not assist him.
Notwithstanding, he would be ordered to maintain the offspring 'until he shall have plainly proved in the principle case that the offspring was not born to him'.

reality. Where, however, the presumption and the biological truth were clearly at odds, provision was made in law for a rebuttal of the presumption. However, the proof required to rebut the applicable presumption was often difficult, if not impossible, to obtain and the man was then considered to be the father of the child even if he categorically denied it. In such a situation, the Roman-Dutch jurists would still tend to accept his paternity as a matter of fact and concomitantly impose the rights and duties of legal fatherhood.

It is clear from the seventeenth and eighteenth century Dutch writings that the prevalent attitude was one whereby the father was somewhat arbitrarily determined by rules of law. I would suggest that this is, again, because of the absence of any scientific test or other test that could positively inculpate or exculpate the alleged father with any degree of certainty.

1.2 CURRENT SOUTH AFRICAN LEGAL APPROACHES TO THE PATERNITY ISSUE

In recognition of the problems inherent in the Roman and Roman-Dutch law, the trend of the law in recent years has been to follow the biological reality as closely as is desirable in the interest of the child.

With reference specifically to married women, the best interest of the child is seen by law as in having a father, preferably the husband of the mother. In consequence, only the husband is allowed to rebut the pater est quem nuptiae demonstrant presumption, says Thomas, and if he elects not to dispute his paternity, nobody else may contest the presumption.[14] What this means, then, is that the children born to a wife will have her present husband as their father, or, phrased alternatively, it gives the husband the right to all of his wife's children. Even if he is not the biological father, should he decide not to contest the pater est quem nuptiae demonstrant presumption, the natural children of his wife, conceived during the subsistence of their marriage, are, legally, his children.[15]

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[14] Thomas Ph. J. 'Paternity: Legal or Biological Concept?' 1988 105 SOUTH AFRICAN LAW JOURNAL 239, at 247.

[15] Ibid, at 248. It could be argued that the principle behind such a rule is somewhat outdated. In today's less conservative society, where 'living together' without the ties of matrimony is fast becoming an accepted norm, we are already at the stage where fathers of illegitimate children are attempting to use the courts to establish paternity rights to their children born out of wedlock. In substantiation hereof, the reader is referred to the cases of D v L 1990 (1) SA 894 (W), F v B 1988 (3) SA 948 (D), Douglas v Mayer 1987 (1) SA 910 [ZH], W v S 1988 (1) SA 475 (N), Rucker v Oosthuizen 1989 (2) PH B1 [SWA] and Van Erk v Holmer 1992 (2) SA 636 (W). These rights could easily include custody of the child (or at least, access), or prevention of the child's adoption. Because the father claiming paternity and seeking such rights to his illegitimate child bears the burden of proof, he will need a certain and precise method of proving paternity, like the DNA test.

Important policy considerations are raised, however, where a man who alleges that he is the biological

father attempts to use the DNA-profile test to invade a family unit and challenge the paternity of a child already accepted as legitimate and part of the family unit. Possibly the strongest public policy argument militating against such a paternity claim by the alleged biological father is the argument in favour of preserving and maintaining the family unit, for the opinion will always prevail that the child has become an accepted and integral part a family unit and to create disillusionment at a young age could have traumatic repercussions on his psyche as well as his continued emotional and psychological development.

Consequently, in F v B 1988 (3) SA 948 (D), it is quite clear that the court gave greater weight to the established emotional family ties between the legal father and the child. (See also F v L and Another 1987 (4) SA 525 (W), at 528). Boberg is highly critical of both these decisions, describing them as reflecting an approach totally out of keeping with modern beliefs. He says: "Whilst the matter has not been affected by legislation and the common law DOES apply, it seems distinctly quaint to see in this day reliance being placed upon a decision (Calitz v Calitz 1939 AD 56) so flagrantly chauvinistic in spirit and so patently out of tune with the times." Boberg P.Q.R. 'The Sins of the Fathers' 1988 18 BUSINESSMAN'S LAW 35, at 38.

However, the Colorado case of R. McG v J.W. 615 P. 2d 666 (Colo 1980) ended quite differently. Whilst the minority judgement clearly emphasised the state's strong interest in promoting durable family ties, the majority based its decision on equal protection grounds that maybe an unwed father should have the right to seek his paternity rights concerning a child born to a marriage, just as an unwed mother can institute a paternity suit against a married man: Blumberg P.B. 'Human Leucocyte Antigen Testing: Technology Versus Policy in Cases of Disputed Parentage' 1983 36 VANDERBILT LAW REVIEW 1587, at 1610.

Unfortunately, one could very easily find oneself in the unenviable position of agreeing with both schools of thought. Therefore, to circumvent some of the problems, I would propose that an appropriate statute of limitations could govern most effectively the use of the DNA-profile test (or other forensic tests of identification) in cases where the father sues to establish his paternity to a child already part of a family unit. I believe that it would be an exhibition of blatant discrimination by the law were the lawmakers to continue to prohibit a father from, for example, claiming visitation rights with his

The husband's right to rebut the presumption that he is the father of the child does not lapse with the course of time. He may rebut the presumption at any time.[16]

Adherence to the outdated Roman-Dutch law with regard to extra-marital children could certainly lead to a series of decisions patently out of step with modern advancements in the law and medicine.[17] Consequently, in R v Swanepoel,[18] the court accepted Schorer's criticisms of the broad rule laid down by Groenewegen. The court held, therefore, that a presumption of paternity would only arise if intercourse

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biological child if he institutes the action within a reasonable time. Blumberg suggests that two years from the date of the child's birth would be a reasonable period: Blumberg P.B. 'Human Leucocyte Antigen Testing: Technology Versus Policy in Cases of Disputed Parentage' 1983 36 VANDERBILT LAW REVIEW 1587, at 1611. Cronje, too, believes that it would, perhaps, be expedient that a time limit be set within which the presumption should be rebutted. They refer, in this regard, to the German law, quoting paragraph 1594 BGB which provides that the husband must rebut the presumption within 2 years after he has become aware of the birth of the child. (One might suggest, however, that in place of 'husband', the word 'father' would be a more acceptable substitute.) Cronje D.S.P. THE SOUTH AFRICAN LAW OF PERSONS AND FAMILY (Durban 1990: Butterworths) 60-1.

Basing my proposal on the current esteem for the DNA test, I would, however, suggest that DNA profile tests should be unconditionally admissible in all paternity claims involving illegitimate children who do not have a legal father. Positive identification of the biological father would in many cases benefit the illegitimate child both emotionally and financially, the exception arising where the illegitimate child has already bonded to the legal husband of his/her mother.

16 Cronje D.S.P. op. cit. Note 15 supra, at 61.

17 S v Swart 1965 (3) SA 454(A).

18 1954 (4) SA 31(0).

a presumption of paternity would only arise if intercourse at the critical time of conception were proved.[19]

In the early 1980's, in recognition of the two diametrically opposed schools of thought, a South African Law Commission was constituted to investigate the status of illegitimacy in South Africa. Its findings led ultimately to Parliament promulgating the Children's Status Act 82 of 1987. Section 1 of the said Act deals explicitly with the presumption of paternity in respect of extra-marital children. The section reads as follows:

> If in any legal proceedings at which it has been placed in issue whether any particular person is the father of an extra-marital child it is proved by way of judicial admission or otherwise that he had sexual intercourse with the mother of that child at any time when the child could have been conceived, it shall, in the absence of evidence to the contrary, be presumed that he is the father of the child.

However, from the wording of section 1, it appears, unfortunately, that the legislature failed to clarify sufficiently whether they have, in fact, altered the common law. One could question, therefore, whether the presumption will now only apply where intercourse took place at the critical time, or is intercourse at the critical time as well as any other time, acceptable? By omitting to establish clearly the parameters of

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[19] Ibid.

application of this section, seeds of confusion have been sown. On the other hand, however, Craig Lind maintains that if one were to apply and rely on the maxim of legal interpretation: expressio unius est exclusio alterius - which, when translated, reads 'Mention of the first will exclude the alternate' - we may conclude that, by stating that the presumption of paternity arises where intercourse at the critical time is proved, the legislation is taken to have excluded the possibility of applying the presumption where intercourse at any other time is proved.[20] This would be quite correct according to Devenish's translation of the presumption which is that the 'expression of one thing is the exclusion of the other'.[21]

Lind believes that the word 'only' that is absent from the legislation should be taken to be implied.[22] He substantiates his point by saying that legislation must be interpreted so as to give effect to its intention. And clearly the legislature must have intended its measures to have some effect.[23] However, one cannot help but agree with the sentiments of Justice Trollip when he said:

> It is hard to understand why lawyers do not avoid the uncertainty and forestall the difficulty of that kind by the

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[20] Lind C. 'Proving Paternity - Still a Problem' 1988 18 BUSINESSMAN'S LAW 23, at 24.

[21] Devenish G.E. INTERPRETATION OF STATUTES (Cape Town 1992: Juta and Co.) 85.

[22] Op. cit. Note 20 supra, at 24.

[23] Ibid.

> are to be exclusive, alternative, or additional, as the case may be.[24]

Most probably, then, the common law rule of paternity with regard to unmarried mothers has been circumscribed by section 1. In all other respects the common-law is, by and large, still adhered to with necessary changes introduced to keep abreast of relevant technological advances.

The trite common-law rule of legitimacy, which still applies, is simply that the parents must be married when the child is conceived or born or at some time between the date of conception and the date of birth. Maternity is less often the issue; more often than not when a dispute arises, it is the question of paternity which is placed in issue. Due to the fact that there are different rules which apply when the mother is married or unmarried, these two situations will have to be dealt with separately.

1.2.1 The Law Where the Mother is a Married Woman

In such an instance, there will normally be no difficulty in establishing two of the three essential elements for the child's legitimacy: first, that a valid marriage exists, and second, that the wife is the mother of the child; but it may be difficult to prove that her husband is the

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[24] Johannesburg City Council v Knoetze and Sons 1969 (2) SA 148 (W), at 150.

it may be difficult to prove that her husband is the father. In view of the serious social and legal consequences of illegitimacy that did exist, the Roman-Dutch and South African law-makers were prepared to continue to rely upon the Roman law presumption of legitimacy, that is, that a child born to, or conceived by, a married woman is automatically presumed to be legitimate - the maxim pater est quem nuptiae demonstrant applying. This presumption places the onus of any rebuttal on the husband.

The earlier South African case law reflects a demand for 'the strongest possible proof' by 'irresistible evidence' to rebut the presumption.[25] The current attitude of the

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[25] Richter v Wagenaar (1829) 1 Men 262, at 265, where the court ruled that the pater est quem nuptiae demonstrant presumption is rebuttable only by the clearest evidence. Ex Parte Venter (1903) 13 C.T.R. 620, at 620-1; Ngangelwize Kama v The Executors Dative in the Estate of the Late Samuel Kama and Nolenti Kama, and George Songa Kama (1902) 17 E.D.C. 39, at 45, in which case Hopley J held that if the husband could be shown to have had access to his wife or to have gone to the part of the country in which his wife was residing so that he might have had access at about the appropriate time prior to the birth of the child, an almost irrebuttable presumption would arise that such a child was legitimate. Atkin v Estate Bowmer 1913 CPD 505, at 509 and 511. Bisset M. and Smith P.F. THE DIGEST OF SOUTH AFRICAN CASE LAW Vol II (Cape Town 1927: Juta and Co) 1032-3. Until recently, in England, too, in W v K, it was held that a suitably high standard of proof is required to rebut the presumption and that proof on a mere balance of probabilities would not suffice: 'Recent Decisions' 1988 18 FAMILY LAW 64. However, Bevan says that this decision appears to be contrary to the view expressed by the English Law Commission enquiring into this issue which stated that where a husband has denied being the father of his wife's child, but has been unable because of the strength of the presumption

South African judges appears to be somewhat contrary. It appears that now the standard of proof required is no greater than in any ordinary civil case, namely, proof on a balance of probabilities.[26] What this now means is that the pater est quem nuptiae demonstrant presumption may be rebutted by acceptable evidence to the contrary, showing on a balance of probabilities that the husband of the mother is, in fact, not the father of the child, in other words, demonstrating that the child is illegitimate. Furthermore, with the application and use of the relatively new technique of DNA-profiling, it may reasonably be anticipated that cases in which paternity is still in doubt following medical tests will become rare because DNA-profile tests can now establish, with virtual certainty, whether a man is the father.[27] Within the context of establishing paternity, therefore, the debate as to whether proof on a balance of probabilities is sufficient or not seems likely to be of little consequence.

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of legitimacy to prove that he is not, the emotional and financial effect on the child is not likely to be beneficial if the husband is nevertheless still firmly convinced that he is not the father: Bevan H.K. CHILD LAW (London 1989: Butterworths) 66-7.

In 1972, Lord Morris had uttered similar sentiments in S v S [1972] A.C. 24 when he said that it would be of no benefit to a child to have a 'father' from whom no recognition, no affection and no benevolence will come.

[26] Van Lutterveld v Engels 1959 (2) SA 699(A).

[27] For a more comprehensive discussion see Chapters 3 and 4 infra.

Further, section 101(3) of the General Law Amendment Act 46 of 1935 did away with a pre-existing and, one might add, inequitable condition that spouses could not testify 'to bastardize their own issue'.[28] In terms of section 101(3), either (or both) spouse(s) are now competent to give evidence that they did not have sexual intercourse with each other during the period when the child was conceived. In 1977, following the promulgation of the Criminal Procedure Act 51 of 1977, section 344(1) of the latter Act is substituted in place of section 101(3),of the former, as the law. However, the fundamental principles contained in section 101(3) have not been altered. At present, section 3 of the Civil Proceedings Evidence Act 25 of 1965 also lays down that:

> For the purpose of rebutting the presumption that a child to which a married woman has given birth is the offspring of her husband, she or her husband or both of them may give evidence that they had no sexual intercourse with each other during the period when the child was conceived.

The evidence most likely to influence the court in deciding against the presumption, it would appear then, is that of non-access. It is now no longer necessary for the husband to show that he COULD not have intercourse with his wife during the relevant time (as was required by the old authorities)[29]; it will also suffice if he can convince the

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[28] Surmon v Surmon 1926 AD 47.

[29] That is, where he would seek to raise the defence of either impotence or sterility or non-access.

court, by placing credible evidence before it, that he, in fact, DID not have intercourse at the relevant time.

What is the relevant time? Our courts have shied away from the pedantic notion of fixed periods of gestation, and have accepted that the period of gestation from conception to birth, varies considerably. Obviously, if the interval which has elapsed between the last act of sexual intercourse between the husband and the wife to the birth is, for example, two years, the inference will clearly be that the child is illegitimate and that the wife has committed adultery; another example might be if the child is born two weeks after the husband's return from a prolonged absence lasting several years. Except in such obvious cases, medical evidence must be led to show that intercourse at a particular time between the mother and the alleged father could not have led to the procreation of the child in question. Once it is certain that the husband did indeed have sexual intercourse with his wife during the period of conception, he is presumed to be the father unless he can prove otherwise on a balance of probabilities.[30]

Medical data which may be used in evidence may be gained from blood tests or from the old and new serological techniques, namely, the HLA system of tissue typing, as well as the lately developed deoxyribonucleic acid (DNA)-

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[30] R v Swanepoel 1954 (4) SA 31(0), at 41.

Prior to the DNA profile test, blood samples from the mother, alleged father and child were tested in order to ascertain the genetic characteristics that the child must have inherited from the father. Now, these earlier tests can only definitely show that a putative father is not the father of a child (because he did not possess the necessary gene characteristics).[31] In addition, the tests can not show that a person is the father of a child, only that he possessed the gene characteristics that the father must possess. However, the probability of somebody being the father, no matter how high that degree of probability, cannot, in itself, satisfactorily resolve the question of who is the father (it still being a matter of probability rather than certainty). This evidence, therefore, can merely serve to assist the court in deciding whether the onus of proof regarding legitimacy has been discharged.

What we find, therefore, is that, despite the many refinements in the testing of blood during the latter part of this century, one cannot gainsay the veracity of the statement that "... proof of paternity must rest on a **probability**"[32][my emphasis].

However, as already noted, scientific advances have completely altered the nature of blood testing. The most

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[31] See Chapter 2 infra.

[32] Dodd B.E. 'When Blood is the Argument' 1980 20 MEDICAL SCIENTIFIC LAW 231, at 232.

However, as already noted, scientific advances have completely altered the nature of blood testing. The most recent identity test in paternity disputes, namely the DNA-profile test, is based upon the unique nature of human DNA. Each person's DNA is different from that of any other person, constituting, as it were, a fingerprint of identity. The DNA-profile test is able to "read" this fingerprint. Since one's DNA-profile is, in turn, entirely inherited from an individual's parents, it is possible to determine, by a process of elimination, precisely what characteristics must have been inherited from the disputing parent. Given the unique nature of the putative parent's DNA, it is then possible to see, not whether the alleged parent may be the parent but, rather, whether he or she is the parent. The DNA-profiles or "fingerprints" give unequivocal evidence of relationship. The DNA-profile test is not one of probability, but rather, one of certainty, which is why it is so very important, especially in the sphere of disputed paternity.

1.2.2 The Law Where the Mother is an Unmarried Woman

Where the mother is unmarried, the current law, like the Roman and Roman-Dutch law, provides no presumption to assist her. In this instance, therefore, the mother's allegation that a certain man is the father of her child must be proved against him on a balance of probabilities.

Central to the proof of paternity in such a case is the woman's evidence. Here the legal approach is best understood by viewing the proceedings in two stages: before and after the proof (or admission) of sexual intercourse. Recognising that acceptance of the woman's unsupported accusation could expose many eligible but innocent males to paternity suits which they might find difficult to defend, the late Professor Boberg believed that the law consequently developed the requirement of corroboration of the woman's story, or, at least, the need for some evidence which is given in addition to the mother's which, to some degree, is consistent with her story and inconsistent with the innocence of the defendant.[33]

It seems, however, that the requirement of corroboration is not strictly interpreted by our courts. Chief Justice Watermeyer, in R v W,[34] and Van den Heever J.A., in Davel v Swanepoel,[35] even went to the extent of expressing doubts about whether the requirement ever existed. In Mayer v Williams,[36] the Appellate Division said that corroboration, as such, is not actually necessary. As a result of this decision, now if a court is satisfied with and believes the woman's evidence that the man is the father, then the onus

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[33] Boberg P.Q.R. THE LAW OF PERSONS AND THE FAMILY (Cape Town 1977: Juta and Co) 327.

[34] 1949 (3) SA 722(A), at 779.

[35] 1954 (1) SA 388(A), at 388-9.

[36] 1981 (3) SA 348(A), at 351.

of disproving paternity immediately shifts to him. There is no longer the need for her testimony to be corroborated; all that is required is that she be a credible witness or, possibly, that the man be shown to be an unsatisfactory witness.

The legal position of the illegitimate child is extremely precarious. It is founded upon the principle that, as far as the mother is concerned, the law does not regard the child as illegitimate; his disabilities relate to his rights vis-à-vis his father and third parties. However, a forensic test that can establish beyond a reasonable doubt the identity of the father and place the court in an unequivocal position to decide this essential issue with complete certainty is the DNA-profile test. The importance of establishing paternity is that, once established, the father is liable to maintain the child, at least, though he may still be denied custody and guardianship rights.

CHAPTER TWO

THE BLOOD TESTS CURRENTLY BEING UTILISED IN SOUTH AFRICA TO ESTABLISH PATERNITY, AND THEIR CONCOMITANT PROBLEMS AND LIMITATIONS

2.1 INTRODUCTION

The results of conventional blood tests are being used in a variety of legal proceedings to prove or disprove parentage. For example, a husband may want to show that a child born during the subsistence of his marriage is not his but the result of his wife's extra-marital affair. A woman may need to prove her maternity of a child for the purpose of qualifying for entry into a country under its immigration rules. The most frequent use is in maintenance proceedings when a maintenance order is sought in the magistrates' court by one parent from an alleged parent.

The conventional type of blood test does not seek to prove directly that a particular person is the parent but, as we will see from the following discussion, does so in an indirect manner by excluding other candidates. Thus, to illustrate with an extremely simple example, if only A, B or C could be the father and tests exclude A and B, C emerges as the father by a process of elimination. Over the years, however, techniques have greatly advanced and become more sophisticated, bringing a greater accuracy to

blood tests.

2.2 WHAT THE BLOOD TESTS PRESENTLY IN USE SHOW

People often speak of persons inheriting physical characteristics from their parents. "He has his father's eyes", or, "his mother's nose", are typical comments. However, for an inherited trait to be used for legal testing purposes, it must obviously be better defined than the shape of a nose or a particular eye colour. It must also be detectable in a clearly defined way and must be inherited in a known unvarying pattern. Blood group characteristics or markers fulfil both of these requirements.

The physical process of inheritance - the transmission of genetic information between generations - is based on the existence of two complete sets of genetic information in each individual, one set being inherited from each parent. Both sets participate in determining the appearance of traits in the offspring. The genetic information is coded in units called GENES, a number of which are present together on a structure called a CHROMOSOME. Each person should have forty-six chromosomes arranged in twenty-three pairs. Genes located close together on a chromosome are generally inherited together and are called LINKED GENES. A chromosome from the father is paired with its alternative inherited duplicate set of information from the mother.

The chromosomes of a pair are similar to the extent that all the genes found on one member of the pair are also present on the other member. However, the genes on each chromosome may code for alternate versions of the same trait. Therefore, whilst both sets of chromosomes may, for example, contain the genetic code for height, the genes on one member of the pair may code for tallness, whilst those on the alternate may code for shortness.

Similarly, if the chromosome pair contains the genetic information involving red blood cell formation, we may yet find that one gene might control the production of a certain red cell blood type whilst its partner may control an alternate version of the same type. The paired alternate forms of genes are called ALLELES.[1]

During the production of the egg or sperm cells, which contain the information to be transmitted between generations, the duplicate sets of chromosomes of the mother and father, respectively, are divided at random into a single set each by a process called MEIOSIS. One member of each pair of chromosomes will always be present in the sperm (or egg, as the case may be). During fertilisation of the egg, the single set of information from the sperm

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[1] See McGilvery R.W. and Goldstein G.W., BIOCHEMISTRY: A FUNCTIONAL APPROACH (Philadelphia 1983: W.B. Saunders Co.) 692 ; Guyton A.C., TEXTBOOK OF MEDICAL PHYSIOLOGY (Philadelphia 1981: W.B. Saunders Co. 20-30; Reisner, E.G. and Bolk T.A. 'A Layman's Guide to the Use of Blood Group Analysis in Paternity Testing' 1982 20 JOURNAL OF FAMILY LAW 657, at 657-8.

joins with the single set of information from the egg to produce a new and unique individual.[2]

That a particular gene is present in the body of an individual is deduced from the presence of its product. In the case of blood groups, the product is that substance called an ANTIGEN which can be detected in the blood of a human being. The product (antigen) cannot be present if the appropriate gene is not present.[3] The function of blood group testing for paternity is to determine the blood group antigens present in the mother, the child and the alleged father, and to use this information to determine possible inheritance patterns. Simply, therefore, blood samples are tested in order to determine the genetic characteristics the child must have inherited from the father or mother.

In instances where it is paternity which is in dispute, it must be noted that the current tests adopted in South Africa can only show with certainty that a putative father is not the father of the child because he does not possess the necessary gene characteristics. The tests cannot show that a person is definitely the father of the child; only that he possesses the gene characteristics which the father

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[2] See Smit A.L. and Van Dijk D.E. INTRODUCTION TO MODERN BIOLOGY (Cape Town 1980: Maskew Miller Ltd) 46-8.

[3] Reisner E.G. and Bolk T.A. op. cit. Note 1 supra, at 658.

must possess. The more sophisticated the test, the more complicated the combination of gene characteristics searched for with the result that there will be a smaller number of men possessing the requisite gene characteristics and a greater probability of any man who has a positive test being the father of the child.

Noteworthy at this point, however, is the fact that, no matter how high that degree of probability, it does not resolve the issue of who **is** the father - it remains still a matter of probability rather than certainty. This I deem to be one of the most serious limitations of the current tests being used in South Africa,[4] especially when one compares then to the deoxyribonucleic acid (DNA) profile tests which are already being employed in other first world legal systems.[5]

2.3 THE WAYS IN WHICH TESTS CURRENTLY APPLIED IN SOUTH AFRICA TO DETERMINE PATERNITY ACTUALLY FUNCTION

Currently there are four blood tests which have frequently been applied to establish the paternity of a putative father, namely, the red blood cell test, the human

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[4] For a more detailed analysis and argument, see Chapter 4 infra, at pp.79-84.

[5] For a further detailed discussion on DNA profiling as a method for establishing paternity: see Chapter 3 infra.

leucocyte antigen system, tests using genetic markers from serum proteins and tests using genetic markers from blood cell enzymes.

2.3.1 The Red Blood Cell Test

The role of modern science in questions of disputed parentage began with the discovery of the major blood groupings by Karl Landsteiner, in 1901, at the University of Vienna. He wrote that the major blood groupings present in man are the A, B, O and AB groups.[6]

Dr Landsteiner alleged that these objectively measured characteristics present in Man followed the Laws of Inheritance as discerned by the Austrian monk Gregor Mendel so that:

a) a child cannot have a genetic marker that is absent in both parents;

b) a child must inherit one of a pair of markers from each parent;

c) a child cannot have a pair of identical genetic markers unless both parents have the marker; and

d) a child must have a genetic marker if it is present as an identical pair in one parent.[7]

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[6] Race R. and Sanger R. BLOOD GROUPS IN MAN (Durban 1975: Butterworths and Co.) 8-9.

[7] Polesky H.F. and Lentz S.L., 'Parentage Testing: An Interface Between Medicine and Law' 1984 60 NORTH DAKOTA LAW REVIEW 727, at 732.

Landsteiner explained that the ABO blood group has three alternate genes, namely, A, B and O which are available in pairs in individuals, as described below:

Gene pairs	Antigen
AA	A
AO	A
AB	A and B
BB	B
BO	B
OO	Neither A nor B

Each member of the pair would have been contributed by either the father or the mother of the individual. The ABO test, therefore, consists of identifying the blood type of the parents (A, AB, B or O) and comparing it to that of the child. Because of the extremely elementary nature of the test, it was only fifty to sixty per cent successful in definitely proving non-paternity.[8]

The discovery, in 1927, by Dr Landsteiner and his colleague, Dr Phillip Levine, of the M-N antigen on the red blood cell served to enhance the usefulness in court of blood tests as paternity tests,[9] and yet later, in 1940, Dr

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[8] Blumberg P.B. 'Human Leucocyte Antigen Testing: Technology Versus Policy in Cases of Disputed Parentage' 1983 36 VANDERBILT LAW REVIEW 1587, at 1590.

[9] Ibid.

Landsteiner and Dr Alexander S. Wiener discovered the Rh system.[10] The Rh system showed that human beings carry either an Rh-positive or Rh-negative antigen. The Rh system provided yet another genetic marker helpful in improving the exclusion rate in a paternity test.

Subsequently, over fifteen other systems were identified all of which served to enhance the evidentiary value of the red blood test in a paternity dispute.[11]

In studying the results obtained from a red cell system test we can only establish a basis to exclude a man from being the father of a particular child. There are two classes of exclusions which are recognised: first and second class exclusions. A first class exclusion is one in which the child possesses an antigen (and therefore a gene) which neither the mother nor putative father possess.[12] For example (using the Rhesus system):

Rh antigens	:	D	C	E	c	e
Mother	:	+	+	0	+	+
Child	:	+	+	+	+	+
Putative Father	:	+	+	0	+	+

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[10] Ibid.

[11] Ibid, at 1591.

[12] Reisner E.G. and Bolk T.A. op. cit. Note 1 supra, at 664.

In the aforementioned case, the child has the E antigen and must, therefore, have inherited the E gene. Since the mother does not possess the antigen, the child must have inherited the corresponding gene from the father. Since the alleged father in this case does not possess the requisite E antigen (nor, therefore, the corresponding gene), he is excluded from paternity of this child. A first class exclusion is firm evidence of non-paternity.

A second class exclusion is one in which the child lacks a gene which he must have inherited from the father. For example (using the MNSs system):[13]

	Mother	Alleged Father	Child
Antigen	S	M	S
Gene	SS	MM	SS

In this case, the putative father is M positive, N negative which means that he should have two M genes and any child of his should inherit an M gene from him. The child in his case did not inherit the M gene so this man is excluded from paternity.

A second class exclusion is good evidence of non-paternity but is not perfect because of the existence of rare genes

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[13] The MNSs blood group has four alternate genes namely M, N, S and s which are available in pairs in individuals. For example, it could be MM, MN, MS, Ms, NN, NS, Ns, SS, Ss or ss.

in each blood group system. If the putative father possesses one of these rare genes and the child has inherited the same rare gene, the situation may exist when the apparently excluded father is, in fact, the natural father.[14] Examine the following example for illustration. Let M^R be the rare gene.

	Mother	Alleged Father	Child
Antigen	S	M	S
Gene	SS	M^RM	M^RS

Because of its rarity, M^R may not be picked up. The alleged father has typed for the ordinary M antigen (and it is assumed, gene), therefore, it is for this antigen only that the testers will look in the child's blood group. Being unable to detect the M^R antigen, the child will be typed for the S antigen only.

The problem of rare genes is not insurmountable for, if they can be identified in the alleged father, tests may be performed using a reagent specifically for the rare antigen (if available) or by finding additional exclusions using other blood groups.[15]

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[14] Boonlayangoor P.W., Telischi M. and Paulsen M.D. 'Paternity Blood Testing: Analysis, Interpretation and Selection of a Program to Verify Parentage' 1987 75 ILLINOIS BAR JOURNAL 278, at 279.

[15] Reisner E.G. and Bolk T.A. op. cit. Note 1 supra, at 665.

Limitations of Red Blood Cell Systems

As indicated earlier, red blood cell systems are not particularly useful in paternity testing because each system is composed of relatively few genetic markers.[16] Consequently, these markers are found with high frequency in the general population and thus their power of exclusion, that is, the ability to exclude true non-fathers, is not particularly high. A combination of six of the most commonly-used red blood systems, namely, the ABO, Rhesus (Rh), MNSs, Kidd, Kell and Duffy Systems, can exclude only sixty-three to seventy-two per cent of true non-fathers.[17] In other words, out of one hundred true non-fathers, these tests will only exclude approximately seventy men.

What this means very simply then, is that, if excluded, non-paternity is certain: but if not excluded, the accused could be a true non-father (falsely accused) who falls within the roughly thirty per cent of the population segment for which these tests lack the capability to exclude.

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[16] Supra, at pp.35-5.

[17] Ianucci S. 'Establishing Paternity Through HLA Testing: Utah Standards for Admissibility' 1988 3 UTAH LAW REVIEW 717, at 722.

2.3.2 The Human Leucocyte Antigen (HLA) System

Early blood tests had located antigens only on red blood cells. Most of the red cell blood group systems used in paternity analysis are relatively simple, with each system being made up of rather few antigens.

The first evidence of HLA blood groups was discovered in 1954,[18] but, since that time, the number of HLA antigens discovered has increased rapidly. The HLA system is, therefore, extremely complex when compared to the red blood cell system.

HLA genes are always found on one chromosome (number six) at loci identified as A and B. HLA gene nomenclature is relatively straightforward. HLA genes at locus A are identified as HLA-A, and those found at locus B are similarly identified as HLA-B. While chromosome six carries the genes that determine HLA characteristics, HLA genes are also expressed as antigens on most cells of the body, including white blood cells. Most importantly, there are a variety of A and B genes that can occupy the A and B loci on chromosome six and, correspondingly, a variety of A and B antigens that are expressed on the cells of the body.[19] In fact, research has demonstrated that over sixty-

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[18] Ibid.

[19] Lämm, Gürtler and Hansen THE SYSTEM IN INCLUSION PROBABILITIES IN PARENTAGE TESTING (New York 1983: R. Walker) 381-9.

five HLA-A and a further excess of sixty-five -B factors have been discovered.[20]

Every individual has four HLA genes, two A and two B, with one A and one B inherited from the mother and one A and one B inherited from the father. The A and B loci are so close together on the chromosome that ninety-nine per cent of the time the A and B genes are passed together from parent to child as a unit, called a HAPLOTYPE.[21] A child thus normally receives one haplotype from the mother and one from the father. As with the red blood cell tests, these tests, too, are not done for the genes themselves, but for their corresponding antigens. From the aforementioned explanation it should be rather obvious that every person will also have two HLA antigens of the A locus and two of the B locus. Each A antigen is also in haplotypic combination with a B antigen. Every human should inherit one A antigen in combination with one B antigen (i.e. one haplotype) from each parent. Because there are so many A and B alleles and so many possible combinations of A and B alleles as haplotypes, the frequency of each allele and haplotype is usually fairly low.[22]

To illustrate exactly how the HLA system works in practice

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[20] Polesky H.F. and Lentz S.L. op.cit. Note 7 supra, at 737.

[21] Iannucci S. op. cit. Note 17 supra, at 724.

[22] Ibid.

examine the following examples:

Case 1:

Father	:	A1 - B7	and	A2 - B8
Mother	:	A3 - B12	and	A10 - B13
Child 1	:	A1 - B7	and	A3 - B12
Child 2	:	A2 - B8	and	A10 - B13

What we find is that the father has two sets of HLA combinations, A1 - B7 and A2 - B8. He must pass one or other of these sets on to all of his children. Exactly the same thing occurs for the mother. The children must receive one A - B combination from either parent.

Case 2:

Alleged Father	:	A2, 3	;	B 7, 8
Mother	:	A30, 28	;	B12, 12
Child	:	A30, 1	;	B12, 40

In this case, the child has received the A-B combination of A30 - B12 from the mother and therefore, obviously, received the A1 - B40 combination from its natural father. The alleged father has neither antigen and is, therefore, excluded.

Case 3:

Alleged Father	:	A1, 28	;	B12, 13
Mother	:	A28, 1	;	B13, 8
Child	:	A28, 2	;	B13, 14

In the aforementioned case,that is, Case 3, the father, mother and child share the HLA antigens A28 and B13. However, the combination of A28 - B13 was inherited from the mother since her contribution must be "subtracted" first.[23] Therefore, the child received the A2 - B14 combination from its natural father. Since the alleged father possesses neither A2 nor B14, he is excluded.

Because the HLA antigens are so numerous, and because they are inherited as sets of two (or sometimes three) antigens, Reisner and Bolk believe that they function <u>almost</u> as a genetic "fingerprint".[24] However, the results still do not yield a certainty of paternity and for this reason the courts are loath to recognise the HLA test as affirmative evidence of paternity rather than having merely a corroborative evidentiary value.

The more precise HLA test, however, can serve as two types of evidence: as exclusionary evidence to show that the putative father could not be the biological father of the child,[25] and as inclusionary, or affirmative, evidence to indicate the high probability of paternity.[26] The paternity

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[23] Reisner E.G. and Bolk T.A. op. cit. Note 1 supra, at 667.

[24] Ibid, at 666.

[25] Krause H. CHILD SUPPORT IN AMERICA, THE LEGAL PERSPECTIVE (New York 1981: R. Walker) 218-9.

[26] Ibid, at 219-242. The major blood group systems used for paternity testing (the red cell blood test and HLA test) have been studied extensively throughout the

value (and/or paternity index) gives some insight into the possibility of an alleged father producing a single sperm containing all the genetic information a given child received from its father. The chance of such an occurrence for the alleged father is then compared to the chance that an unrelated man of the same race as the alleged father could produce such a sperm. This value may be expressed as a per cent (likelihood of paternity) or as a simple comparison of the chance of the alleged father producing a sperm divided by the chance of a random man producing such a sperm. This value is called the PATERNITY INDEX.[27]

Limitations of HLA Testing

The HLA system is highly complex, consisting of a great number of different genetic characteristics that appear with relatively low frequencies in the general population. HLA testing, therefore, has a greater capability to exclude true non-fathers than red blood cell tests, and consequently, is more valuable as a tool for determining paternity. As of 1983, when the HLA test was used alone,

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world. The inheritance of antigens has ben observed in a large number of unrelated individuals and in families from virtually every race and country. These studies show how the various blood group genes are inherited in families and show the frequencies of genes in different populations. This population information is the basis for preparing statistical estimates of the power of a given blood group system to exclude a falsely accused man or for determining the likelihood of paternity for a non-excluded man in a given man-woman-child combination: Reisner E.G. and Bolk T.A. op. cit. Note 1 supra, at 670.

[27] Reisner E.G. and Bolk T.A. op. cit. Note 1 supra, at 671.

it demonstrated a probability of exclusion of approximately ninety-two per cent.[28] This means that, out of one hundred true non-fathers, HLA testing can exclude approximately ninety-two men. Further, when used in conjunction with the red blood cell tests, the combination can produce a probability of exclusion of approximately ninety-seven per cent.[29]

The HLA test is, therefore, admittedly a powerful tool, not simply because it has a greater capability of excluding true non-fathers, but because the higher exclusionary capability provides a more reliable estimate of an accused's statistical probability of paternity if he is not excluded.

A probability of paternity is determined by comparing the HLA types of the alleged father to a random man by means of existing gene frequency tables. The probability of paternity is based on the following standard assumptions:

1) that the mother had sexual intercourse with the alleged father at the time conception could have occurred;
2) that the mother also had sexual intercourse with one other (random) man of the same racial or ethnic group at the time that intercourse could have occurred; and
3) that there is a fifty per cent chance that the accused

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[28] Iannucci S. op. cit. Note 17 supra, at 723.

[29] Ibid, at 723.

is the father, with a corresponding fifty per cent chance that a random man is the father.[30]

Accordingly, in calculating the paternity index, experts make use of a prior probability figure of 0,5. They state that the probability of a man being the father is equal to the probability that he is not. In the normal triad of mother, child and alleged father this figure works fine, but problems with using a neutral 0,5 prior probability value arise when multiple possible fathers are involved. One can assume a prior probability of 0,5 for the argument that of all the suspects there is a fifty per cent chance that one of them is the father and an equal chance that none may be. If we are dealing with, for example, two possible suspects then the argument that man number one is the father would have a prior probability of only 0,25 and likewise for suspect number two; and the third possibility that neither of the two men is the father would have to be considered and this would have a prior probability of 0,5. The prior probability assumptions become much smaller assuming more than two alleged fathers. A formula for calculation of individual prior probabilities would have to be the prior probability of 0,5 divided by the number of men involved. This would make a significant change in calculating the X-value in the paternity index (L), where L = y and "x" is the probability of obtaining a gamete

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[30] Peterson J. 'A Few Things You Should Know About Paternity Tests (But Were Afraid to Ask)' 1982 22 SANTA CLARA LAW REVIEW 667, at 669-670.

containing genes for all the obligatory factors from the accused male, and "y" is the possibility of obtaining such a gamete from the population at large. These problems are further compounded by the possibility of another variable - what if the mother has not even named the real father?[31]

What one gauges from this aforementioned example is that, in practice, therefore, the paternity index is often actually much lower than is being currently represented. This means that the probability of the named individual actually being the father is correspondingly much lower than indicated by standard calculations.[32] Richard Borowsky, however, believes that the entire formula of paternity index calculation is faulty.[33]

He cites the following example:

Consider the case where the mother is typed A1, A2, B44, B51 and her child as A1, A3, B8, B51. Clearly, the child

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31 Studies conducted in the Federal Republic of Germany showed that the mother only named the real father in 84% of the cases: Hümmel 'On the Theory and Practice of Essen-Möller's W value and Gürtler's Paternity Index (P.I.)' 1984 25 FORENSIC SCIENCE INTERNATIONAL 1, at 12. This figure is close enough to Hirschfield's estimate from Scandinavian studies that only 75% of the paternity trios contained the true father: Mayersak J.S. 'Methods of Defence in Contested Blood Cases' 1989 35 MEDICAL TRIAL TECHNIQUE QUARTERLY 439, at 441.

32 For a more detailed discussion see Mayersak J.S. op. cit. Note 31 supra, at 439-449.

33 Borowsky R. 'HLA and the Probability of Paternity' 1988 42 AMERICAN JOURNAL OF HUMAN GENETICS 132, at 133. For a fuller discussion see infra, at pp. 44-5.

has inherited the A1 B51 haplotype from its mother and A3 B8 from its father. A male accused of paternity is typed A2, A3, B8, B44. Since he has both obligatory alleles, he cannot be excluded. Therefore, what is the probability of paternity?

Depending on how his genes were linked, there is a fifty per cent chance that the man could be A3 B8; A2 B44 but equally there exists the chance of his being A3 B44; A2 B8. The former linkage phase implies that he could be the father whilst the latter implies not for he could not have provided the obligatory haplotype.

Thus, what is apparent is that the same phenotypic data could provide strong evidence for two diametrically opposed interpretations, depending on linkage.

Linkage phase uncertainty is recognised by paternity testers and is typically disposed of by treating the accused as if he had been selected at random from the population. According to currently used statistics, the likelihood of a random man having the phenotype A3 B8, A2 B44 is 68,6 per cent whereas 31,4 per cent would not. This figure of 68,6 per cent is then used to calculate the "x" value in the formula, which leads to a calculation of paternity equal to 98,9 per cent.[34] Yet, the calculation of this value incorporates the assumption that the accused has

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[34] Borowsky R. op. cit. Note 33 supra, at 133.

a 31,4 per cent chance of not even having the obligatory haplotype. Were this latter assumption correct. the true probability of paternity could not e3xceed 100% - 31,4% = 68,6 per cent. Borrowsky believes that the entire set of calculations is flawed for the simple and fundamental reason that we cannot treat thae accused as a random man when assessing the "x" value.[35] Calculation of the paternity index requires that the probability of obtaining a sperm of the obligatory genotype from the accused be known. Paternity indices can only be properly calculated from HLA data if the linkage arrangements in the accused are known, because such information is rarely available because it would have to come from studies of the accused's family.[36]

Further, problems encountered with regard to paternity index calculations are based on the fact that, in performing the calculation, testers are assuming that all of the possible gene combinations with their frequencies of occurrence are known.[37] J.S. Mayersak contends that the HLA possibilities are not all known, for new antigens are being discovered every year.[38]

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[35] Ibid.

[36] Ibid, specifically at 132-4.

[37] Borrowsky R. op. cit. Note 33 supra, at 133.

[38] Op. cit. Note 31 supra, at 442. See also Reading A. and Reisner E.G. 'The Effect of Differences in Gene Frequency on Probability of Paternity' 1985 30 JOURNAL OF FORENSIC SCIENCES 1120.

Other disadvantages of the HLA system involve difficulties with the testing procedure itself. The actual test for human leucocyte antigens depends on observing the killing of lymphocytes by antibodies directed to the genetic markers on their surface.[39] This test, known as lymphoctotoxicity, is highly specific when conducted properly. The conditions for testing are rigid and include having living cells in the test system. Samples for the HLA test must, therefore, reach the testing facility within a specified period of time so that living lymphocytes from the person being tested may be harvested from the blood.[40] White blood cells are generally viable for only twenty-four to seventy-two hours after drawing the blood sample.[41] Therefore, the HLA test must occur within this time span. This creates extreme difficulty with regard to mailed samples of blood to testing centres because, of necessity, the basis of the test requires that the sample arrive within this period. Further, such samples must be properly packed in specially insulated boxes to protect the sample from extreme temperatures.[42]

Finally, the time period involved in paternity cases becomes even more important from the consideration of

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[39] Polesky H.F. and Lentz S.L. op. cit. Note 7 supra, at 737.

[40] Ibid.

[41] Blumberg P.B. op. cit. Note 8 supra, at 1592.

[42] Ibid.

nomenclature changes for the factors of the HLA system. Mayersak illustrates this point very clearly in his article under the sub-heading 'Lack of Knowledge Concerning HLA Antigens'.[43] He says that it frequently happens that between the time of conducting the initial HLA typing of the mother, the child and the alleged father, and the case actually coming to court, the nomenclature of the HLA antigen may have changed and the sample of the alleged father may now represent an HLA split. A "split" is when an antigen was originally thought to be a single antigen, but is subsequently found to represent more than one antigen. For example, antigen B5 over a period of time splits and the result is the same as the presence of antigen B51 and B52; A19 is now recognised as A25, A26, A34 and A66, and so on. The obvious conclusion is that the father of yesterday is most likely not going to be the father today because of the increased ability to exclude with the new split. The very least that can be said is that he types differently later than he did originally.

2.3.3 Other Genetic Markers in Blood: Serum Proteins and Blood Cell Enzymes

Besides red cell and HLA antigens found on the surface of red and white blood cells, blood also contains many other molecules which exhibit variations controlled by inherited genes. Many of these systems fulfil the criteria for

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[43] Op. cit. Note 31 supra, at 444.

legally acceptable tests in that the markers are detected in a defined manner and their inheritance is well understood.

Basically, variations in patterns appear when soluble preparations of red cells or blood plasma from different individuals are subjected to a high voltage electric field in a supporting gel. Different inherited forms of the molecules differ in how rapidly they move in the electric field. The position of the different molecules is located in the gel by using special staining techniques.[44]

Limitations of the Serum Protein and Other Cell Enzyme Tests

These tests, according to Reisner and Bolk, are not very useful in daily blood bank work. They are performed only in specialised laboratories for parentage determination. The laboratory staff must be experienced in the technical procedures and in the interpretation of results if they are to use and evaluate these tests correctly.[45]

The advantage of electrophoretic tests is that samples may be conveniently sent through the mail, and may be preserved by freezing. The major drawback, however, is that a series

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[44] Reisner E.G. and Bolk T.A. op. cit. Note 1 supra, at 669.

[45] Ibid.

of tests must be performed. This takes about one week. A second disadvantage is that these systems are not so thoroughly studied in populations as are red cell antigens and HLA. These tests are, therefore, generally presently only recommended for use in situations where HLA results and/or red cell results are inconclusive.[46] They may also be used when a very complete series of tests is desired.

2.4 CONCLUSION

Presently, what we have is the use of six red blood cell antigen systems (namely ABO, Rh, MNSs, Kell, Duffy and Kidd) and also the HLA system, in analysis of disputed parentage. Using these seven systems, the power of the cumulative chance of exclusion for a "falsely accused man", is about ninety to ninety-five per cent; that is, this combination of testing systems should correctly exclude the innocent man about ninety to ninety-five per cent of the time and wrongly include the innocent man as the true father about five to ten per cent of the time. This is clearly a situation that cannot be countenanced, especially since there is an alternative available which could completely remedy this patently unfair state of affairs.

Today, there are numerous other immunological and biochemical systems that have strong potential for use in the ascertainment of paternity. Serum proteins and red

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[46] Ibid, at 669-70.

blood cell enzyme testing alone have a cumulative exclusion value that exceeds ninety-five per cent, and when combined with the serum systems mentioned earlier, the value is more than ninety-nine per cent.

However, although the development and use of these genetic systems represented a considerable advancement at the time, they may no longer be considered "state of the art", and because of the one to ten per cent of individuals who are incorrectly not excluded, they must surely be considered quite inadequate.[47]

This is, therefore, clearly a situation that should not be accepted, especially in light of the fact that there is an alternative test available, namely the DNA profile test, which can completely remedy this obviously unfair state of affairs.

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[47] See Boonlayangoor P.W., Telischi M, and Paulsen M.D. op. cit. Note 14 supra, at 276; Salmon C., Catron J. and Rouger P. THE HUMAN BLOOD GROUPS (Philadelphia 1984: W.B. Saunders Co.) 397.

CHAPTER THREE

SCIENTIFIC BACKGROUND: HOW THE DEOXYRIBONUCLEIC ACID PROFILE TESTS WORK

This chapter is specifically intended to familiarise the reader with deoxyribonucleic acid (DNA), its characteristics and its forensic application - specifically how the DNA test for identification is conducted.

3.1 THE SCIENTIFIC PRINCIPLES UNDERLYING THE DNA PROFILE TESTS

3.1.1 What is Deoxyribonucleic Acid?

Deoxyribonucleic acid (DNA) is the substance in the human body that contains the genetic instructions used to assemble and regulate all life forms. The differences we see in each other, for example, eye colour, hair and skin colour, to facial features and shoe size, are the outward manifestations of each person's unique DNA pattern.[1] The specific segment of DNA responsible for each inherited characteristic is called a gene.

The DNA in human cells are folded into compact packages called chromosomes. Each chromosome contains just one

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[1] Guyton A.C. TEXTBOOK OF MEDICAL PHYSIOLOGY (Philadelphia 1981: W.B. Saunders Co.) 28 et sec.

double strand of DNA. There are approximately one hundred thousand genes on the forty-six chromosomes in a human cell.[2] These forty-six chromosomes are arranged in twenty-three pairs, and one chromosome per pair is inherited from each parent.[3] This combined maternal and paternal genetic pool accounts for the inheritance of recognisable, but not identical, traits from one generation to another. It is this pattern of inheritance that facilitates the determination of parentage by the DNA test. Furthermore, the potential for variation between the generations is enormous. In meiosis, the process of creating either the egg or sperm cells, segments of all the chromosomes are rearranged in a process known as 'crossing-over'. This cross-over results in a 'patchwork of segments from the two chromosomal parents' and explains why siblings do not have identical DNA or characteristics.[4]

A complete copy of an individual's DNA is located in the nucleus of every cell, with the exception of mature red blood cells. Having neither a nucleus (nor mitochondrion),

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[2] White R. and Lalouel J-M. 'Chromosome Mapping with DNA Markers' 1988 No.2 SCIENTIFIC AMERICA 40, at 40.

[3] According to Kelly K.F., Rankin J.J. and Wink R.C. 'Method and Applications of DNA Fingerprinting: A Guide for the Non-Scientist' 1987 CRIMINAL LAW REVIEW 105, at 105-6 '[The] human blueprint is carried in discreet packets of information known as chromosomes, and the material of which they are made is called DNA. There are 46 such packets within a cell and they can be arranged by means of common characteristics ... into 23 pairs'.

[4] For a fuller discussion on crossing-over see infra, at p.58 et sec.

these cells do not contain any DNA. DNA profile tests can, however, be performed with identical results on a variety of biological materials: semen, blood, hair roots, bone marrow and any other tissue containing nucleated cells.[5]

Each person has a unique molecular DNA pattern. The molecular structure of DNA resembles a twisted ladder.[6] The sides of the ladder, called strands, comprise alternating molecules of sugar and phosphate chemical groups. Attached to the sugar component is a nitrogenous group. These nitrogenous constituents are referred to as bases. There are only four bases in DNA, namely, adenine, thymine, guanine and cytosine. They, in turn, may be further separated into complementary pairs: adenine and thymine form one pair, while guanine and cytosine form the other. The bases in each pair have the ability to attach loosely, by hydrogen bonding, to each other, forming as it were the 'rungs' of the ladder. In this way, the two separate strands of DNA are bound together: one base of a pair is on one strand of DNA, and the complementary base of that pair is in a corresponding position on the other strand. They are bound together by loose and reversible hydrogen bonds. The effect of the loose, reversible hydrogen bonds is that the double strands of DNA may be

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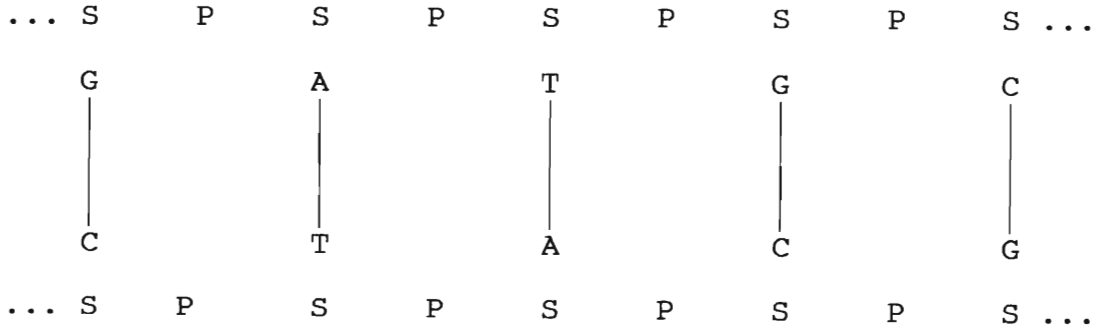
[5] However, it should be noted that in addition to mature red blood cells, DNA tests cannot be performed on urine, faecal matter, hair shafts and nails as they are not made up of living cells and, consequently, do not contain DNA.

[6] Guyton A.C. op.cit. Note 1 supra, at 28-9.

separated (denatured) - which characteristic is of fundamental importance to the process of DNA-profiling - or annealed, under proper conditions.[7]

DIAGRAM 1: HYPOTHETICAL FRAGMENT OF A DOUBLE STRAND DNA MOLECULE

KEY		
S	=	sugar molecule
P	=	phosphate molecule
A	=	Adenine
T	=	Thymine
G	=	Guanine
C	=	Cytosine
-	=	hydrogen bond



There are approximately six billion (6×10^9) 'rungs', or

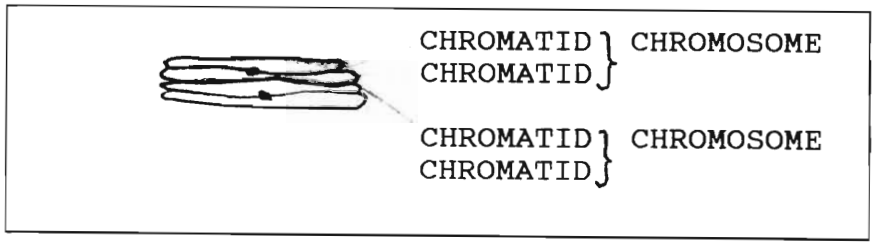
[7] Ibid, at 29. McGilvery R.W. and Goldstein G.W. BIOCHEMISTRY: A FUNCTIONAL APPROACH (Philadelphia 1983 : W.B. Saunders Co) 56-7.

base pairs, in every human cell.[8] Every individual's DNA has a distinctive ordering of these base pairs, namely, guanine and cytosine (or cytosine and guanine) and thymine and adenine (or adenine and thymine). Different individuals, however, possess an incredible variation in the ordering of their DNA base sequences. DNA-profile tests utilise these variations in the location of base pair sequences to differentiate between individuals and to trace paternity.

3.1.2 Where is DNA found?[9]

Each individual chromosome is composed of two chromatids so that a paired set of chromosomes will represent a four partite structure. Diagrammatically, we could represent it so:

DIAGRAM 2: ONE PAIRED SET OF CHROMOSOMES



When fertilisation occurs, one male gamete fuses with one

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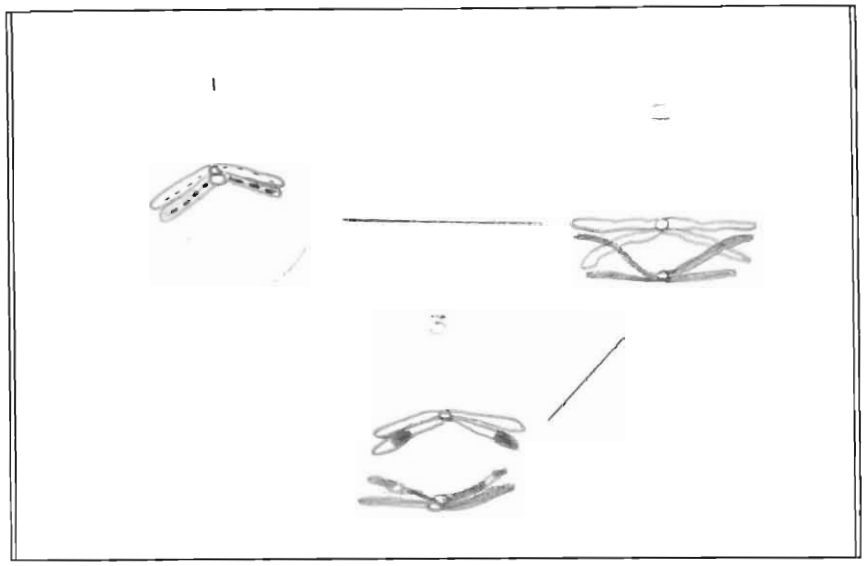
[8] McGilvery R.W. and Goldstein G.W. op. cit. Note 7 supra, at 58.

[9] See generally Dupraw E.J. DNA AND CHROMOSOMES (New York [1970]: Holt, Rinehart and Winston); Smit A.L. and Van Dijk D.E. INTRODUCTION TO MODERN BIOLOGY (Durban 1980: Maskew Miller Ltd) 39-42; McGilvery R.W. and Goldstein G.W. op. cit. Note 7 supra, at 47-8.

female gamete. The cells from which the gametes develop are diploid (like all the body cells) - that is, they will have forty-six chromosomes. Each gamete itself, however, obviously cannot enter into the process of fertilisation as a diploid cell, for the zygote thus formed will have ninety-two chromosomes and be non-human. The gametes must, of necessity, be haploid, that is, each gamete must have only twenty-three chromosomes to ensure that the zygote which is being created will have only forty-six chromosomes. Thus, during the gamete formation the diploid chromosome number becomes reduced by half to give rise to a haploid number in gametes. The two haploid gametes will then fuse to form a diploid zygote.

Gametes, therefore, arise by a special type of cellular division called meiosis. During this process, one of the chromatids belonging to the paternal chromosome exchanges parts with one of the chromatids belonging to the maternal chromosome. Diagrammatically, this is how it would appear:

DIAGRAM 3: CROSSING OVER DURING THE PROPHASE OF THE FIRST MEIOTIC DIVISION



This process occurs in all twenty-three pairs of chromosomes present in the cell. This phenomenon is known as crossing-over. After crossing-over, each chromosome consists of one maternal chromatid (or paternal chromatid, as the case may be) and one chromatid derived from both parents. One of the most important functions of meiosis - apart from the fact that it maintains the constant chromosome number of the species - is that crossing-over results in new DNA combinations in succeeding generations.

3.1.3 Statistical Evidence that the DNA Composition of Every Human Being (Except for Monozygotic Twins) is Likely to be Different

In summary, then, what we find is that almost invariably the two members of the homologous pair (though coding for

the same basic function) differ somewhat from each other. During meiosis, the 2n (diploid) chromosomes become separated into two complements of n (haploid) chromosomes. Assuming differences to exist between the members of the various homologous pairs, we may calculate the probability of identical arrangements occurring where the chromosomes assort naturally.

Now, starting at the beginning, we note that there is only one chance in two, that is, a probability of 0,5, that one member of a pair of chromosomes will occur in a gamete formed during the meiotic process. If we arbitrarily name one member of each pair 'A', then we may correctly conclude that, in an organism with five pairs of chromosomes, there is a probability of 0,5 x 0,5 x 0,5 x 0,5 x 0,5 that a gamete will contain the 'A' chromosome of each pair.[10] Therefore, in the case of human beings with twenty-three pairs of chromosomes, the probability of any particular chromosome contribution in a gamete is 1 in about 8400 000. The probability of the same chromosome contribution from any two human parents is about one in sixty-four billion.[11] Further, during the prophase of the first meiotic division, one of each pair of chromatids loses the constitution of the parent organism and, by crossing over, becomes a composite of the chromatids of the two pairs. Therefore,

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[10] Smit A.L. and Van Dijk D.E. op.cit. Note 9 supra, at 576-7.

[11] Ibid.

apparently, the probability of a gamete obtaining chromatids with the exact composition of the chromosomes of one parent only will be 4^n, where n is the number of pairs of chromosomes in the organism.[12] Thus, for humans, the number of possible kinds of ova or sperm cells is $4^{23} = 7 \times 10^{13}$ and the number of possible combinations of children of two people is calculated at about $(7 \times 10^{13})^2 = 49 \times 10^{26}$.[13]

More simply, but most important, is that in the long term every chromatid will be altered by crossing-over with another chromatid. During the process of crossing-over, there are a very large number of points at which crossing-over may occur and, therefore, a vast number of permutations of the genetic material of a species.[14]

Sexual reproduction amongst homo sapiens naturally involves two persons. Any two who mate are members of a community, usually made up of non-identical individuals. Thus, in a community of just ten males and ten females, mating could take place in any one of a hundred possible combinations. Further, it is at fertilization that the permutations occurring during meiosis came into play. Each male may produce thousands of millions of spermia at one time, while

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[12] Ibid.

[13] Ibid.

[14] McGilvery R.W. and Goldstein G.W. op. cit. Note 9 supra, at 112-3.

females may produce ten, hundreds, thousands or more potential ova. The possible combinations, assuming the gametes all to be different, as we have seen, can be astronomical in number.

3.2 HOW THE DEOXYRIBONUCLEIC ACID PROFILE TEST WORKS

3.2.1 An Overview:

There is a very clear step-wise procedure which must be assiduously followed when conducting these tests in order to ensure reliable and acceptable results. Very briefly:
first, DNA is extracted from the forensic sample, and the hydrogen bonds are denatured so that the double-stranded molecule is separated into two single strands;
second, the strand of DNA is chemically cut into fragments. These fragments are then sorted according to their lengths;
third, a radioactive probe is added.[15] The purpose of the probe is to bind with specific portions of the DNA - notably, those portions which vary from individual to individual. The probe is radioactive and this obviously allows the pattern to be captured on x-ray film;
fourth and finally, the patterns are compared. In a

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[15] A probe is essentially a single-stranded fragment of DNA, consisting of a sequence of nucleotidal bases, that is complementary to a specific DNA base sequence under analysis. These probes can recognise and bind to specific regions of DNA on autosomes and on sex chromosomes. For a fuller understanding of what a probe is and how a probe works see infra, at p[illegible].

paternity dispute, three sets of patterns will be judged, namely, that of the mother, the child and the alleged father. The contribution of the putative parent is then assessed.

3.2.2 How the DNA Test Identifies Individuals

3.2.2.1 Test Preparation

At the outset, the DNA must be isolated from the sample. This is a chemical procedure which involves a variety of chemicals and centrifuging techniques.[16]

At intervals throughout the length of the DNA strand, bases occur randomly in certain combinations of six. The sites are always palindromic, that is, the order of the bases in the bottom strand is exactly the reverse of those in the top strand. These segments in a strand are called restriction sites and, like all the other DNA, are inherited from the parents.

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[16] For a fuller discussion see Gill P., Jeffreys A.J. and Werrett D.J. Forensic Application of DNA "Fingerprints"' 1985 318 NATURE 577, at 578; Jeffreys A.J., Wilson V. and Thein S.L. 'Individual-Specific "Fingerprints" of Human DNA' 1985 316 NATURE 76, at 77;Odelberg S.J., Demers D.B., Westin E.H. and Hossaini A.A. 'Establishing Paternity Using Minisatellite DNA Probes When the Putative Father is Unavailable for Testing' 1988 33 JOURNAL OF FORENSIC SCIENCES 921, at 923-4; Dykes D.D. 'The Use of Biotinylated DNA Probes in Parentage Testing: Non-Isotopic Labelling and Non-Toxic Extraction' 1988 9 ELECTROPHORESIS 359, at 360; Gjertson D.W., Mickey M.R., Hopfield J., Takenouchi T. and Terasaki P. 'Calculation of Probability of Paternity Using DNA Sequences' 1988 43 AMERICAN JOURNAL OF HUMAN GENETICS 860, at 861-5.

Medical science has recognised that certain bacteria have a natural defence system, known as restriction enzymes. These enzymes are capable of specifically recognising these palindromic sequences and breaking DNA at these points. Restriction enzymes can be purified and then utilised to break down the DNA of the sample under consideration.[17] The fact that each individual has a unique DNA composition will cause the length of the DNA segment cut by the restriction enzymes to vary from individual to individual.[18] Then, utilising the process of gel electrophoresis, the scientist is able to sort out the resulting fragments according to their lengths.[19] The outcome of the electrophoresis process is based on the underlying principle of electrical attraction. What happens is that the DNA fragments are transferred to a gel having the capacity and potential to conduct electricity. By the very nature of their composition, DNA fragments are charged. (Naturally, all have negatively charged phosphate-deoxyribose backbones.)[20]

During electrophoresis, an electric current is passed

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17 Kelly K.F., Rankin J.J. and Wink R.C. op.cit. Note 3 supra, at 107; Von Beroldingen W. and Sensabaugh G.F. 'Forensic DNA Analysis' 1987 12 TIELINE 27, at 29.

18 Taitz J.L. 'DNA-Fingerprinting as a Forensic Identity Test - A Reappraisal' 1992 109 SOUTH AFRICAN LAW JOURNAL 270, at 272.

19 Ibid.

20 McGilvery R.W. and Goldstein G.W. op.cit. Note 9 supra, at 56.

through the gel containing the DNA fragments. The negatively charged backbone is attracted to the end of the gel which is positively charged. The longer fragments of DNA move more slowly through the gel than do the shorter fragments, resulting in a gel with the DNA sample fragments sorted by size.[21] The sorted DNA fragments are then denatured or, in other words, the hydrogen bonds forming the rungs of the DNA ladder are broken and the DNA ladder is split into two single strands.[22] The denatured DNA is then transferred from the gel to a more stable medium, typically a nylon membrane. This process is called Southern blotting, being named after its inventor, E.M. Southern. Further, as the name might suggest, this procedure involves the movement of the fragments from the gel to a nylon sheet in a way similar to the movement of ink into blotting paper.[23]

3.2.2.2 The Forensic DNA Test

The sample is now ready to be tested.

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[21] Sensabaugh G.F. 'Forensic Biology - Is Recombinant DNA Technology in its Future?' 1986 31 JOURNAL OF FORENSIC SCIENCES 393, at 393.

[22] The denaturing process does not alter the DNA composition; it only breaks the bond of the double helix: Beeler L. and Wiebe W.R. 'DNA Identification Tests and the Courts' 1988 63 WASHINGTON LAW REVIEW 903, at 913 N49.

[23] For a more comprehensive discussion of this complex procedure see Southern E.M. 'Detection of Specific Sequences Among DNA Fragments Separated by Gel Electrophoresis' 1975 98 JOURNAL OF MOLECULAR BIOLOGY 503-517.

As well as containing the aforementioned restriction sites,[24] the chromosome also has regions of repeated sequences throughout its length. In other words, there are combinations of bases which occur again and again. It has not yet been discovered why segments are repeated, but they do occur and their importance in the DNA profile test procedure is that their existence actually facilitates the identification of DNA fragments.

Alec Jeffreys from the University of Leicester has been studying these segments. His research has illustrated that the repetitive core regions of these segments are shared between all human beings. However, the associated genetic loci of these repetitive regions are highly polymorphic and are inherited.

The repeat elements in a specific subset of minisatellites (or non-coding DNA bases) share a common ten to fifteen base pair core sequence which, it is believed, might act as the signal for the recombination of the two separate but complementary DNA strands.

Earlier in this chapter, mention was made of the DNA strand being made up of two strands held together by precisely matched bases.[25] Thus, a hypothetical strand of DNA:

... T G C A A G T ...

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[24] Supra, at p.64.

[25] Supra, at pp.56-7.

could only match with its partner:

... A C G T T C A ... .

Separate complementary strands which match in this manner have an affinity for each other and, under suitable conditions, can hybridise (bond) with each other to form a double strand. The affinity is such that only minute quantities are required for hybridisation to occur. Now, when the sample DNA is broken by the restriction enzymes and separated into fragments, many of these fragments will contain a portion of the repeated sequences since these regions occur throughout the chromosome.

Scientific advancement has shown that it is possible to purify these repeated sequences and then to label them with radioactivity to enable subsequent detection. Such a radioactively labelled sequence is called a probe. These probes have the potential to hybridise with the repeat sequences present in the fragments separated in the gel.[26]

The probe is added to the nylon membrane which contains the sample DNA. The nature of the probe is such that it is able to bind to specific segments of the denatured DNA sample and radioactively 'mark' those segments, thereby allowing comparison to other DNA samples. Because these repeated sequences occur only in the segments of DNA which

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[26] Kelly K.F., Rankin J.J. and Wink R.C. op.cit. Note 3 supra, at 108.

vary from individual to individual,[27] the probes will bind only to those segments of DNA which vary from individual to individual. Consequently, segments which are recognised by the probe light up, indicating identity between sample and probe. Matching bands between samples will therefore indicate that they contain the same DNA miniloci. The probe actually creates a unique pattern which can identify an individual.

Next, x-ray film is placed over the nylon membrane. Because the probe is radioactive, it exposes the x-ray film with a band pattern which resembles the bar code which often appears on articles packaged for the stores. The presence of a band indicates that the probe has found and hybridized with a segment of the sample DNA. The picture of the bands on the x-ray film is called an autoradiograph. The location of a band on the autoradiograph indicates the length of the DNA fragment containing the probe. The location of the bands varies among individuals depending on their DNA composition. For any individual, however, the location of the bands on the autoradiograph remains constant throughout the individual's lifetime.[28]

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[27] Beeler L. and Wiebe W.R. op.cit. Note 22 supra, at 914.

[28] Mutations within an individual's DNA are very rare, and should not affect the consistency of test results. Mutations may, however, affect the location of bands passed on from parents to their offspring. See Chapter 4 infra, at pp.96-102.

DIAGRAM 4: BANDS FROM THREE HYPOTHETICAL AUTORADIOGRAPHS AND THEIR ANALYSIS

Autoradio-graph 1	Autoradio-graph 2	Autoradio-graph 3	Length of DNA Fragments
	-----		< 46,1 kilobases
-----		-----	< 30,0 kilobases
	-----		< 25,0 kilobases
-----	-----	-----	< 19,7 kilobases
	-----		< 16,0 kilobases
-----		-----	< 1,2 kilobases
-----		-----	< 1,0 kilobases

Analysis of Diagram 4: Autoradiographs 1 and 3 have identical bands. This is a clear indication that they are from the same individual. However, even though all three samples have a band at <19,7 kilobase length, sample 2 also has other, non-matching bands indicating that it is from another individual.

3.2.2.3 Analysis of Test Results

Autoradiographs are read by comparing and interpreting the bands from the different samples. A child inherits roughly half of its DNA from each parent. Sample DNA is taken from the child, the mother and the alleged father, and the DNA test is conducted. The child's bands are first compared with the mother's bands. Those bands which match represent

the maternal contribution of the child's DNA and can be disregarded (unless they overlap with a band from the alleged father). The bands remaining represent the paternal component and are compared with the bands obtained from the putative father to determine parentage. Those bands that are not attributable to the mother's genome must be matched by bands from the alleged father's autoradiograph for him to be conclusively classified as the father. If the bands match, a connection is made between the samples.[29] The number of matching bands is obtained by visually examining the relevant samples and noting the number of matches.

Comparison of DNA profiles is made by examining 40-60 bands before any conclusion is reached.[30] In practice, however, visual comparison may not be as clear and obvious as the example in Diagram 4, on p.67 supra, might indicate. To enhance the veracity of their findings, Lifecodes Corporation is using a computer-assisted digitizing system to compare samples.[31] Further, to avoid any additional

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[29] Lomax I.S. 'DNA Fingerprints - A Revolution in Forensic Science' 1986 April THE LAW SOCIETY'S GAZETTE 1213, at 1214.

[30] Böhm L. 'Advances in Forensic Medicine' 1987 71 SOUTH AFRICAN MEDICAL JOURNAL 276, at 276.

[31] Lifecodes Corporation is one of only six laboratories which are presently conducting the DNA fingerprint test to provide evidence in paternity disputes. Baird M., Balazs I., Giusti A., et al. 'Allele Frequency Distribution of Two Highly Polymorphic DNA Sequences in Three Ethnic Groups and Its Application to the Determination of Paternity 1986 39 AMERICAN JOURNAL OF HUMAN GENETICS 489, at 490.

error involved in determining the size of a particular band in question, accommodation is made, in the ordinary course of the calculations for two standard deviations of possible error in size measurement from the mean size determined for the band.[32]

The DNA test will be particularly useful when the putative fathers are closely related (brothers/cousins) because other blood typing methods may not be able to differentiate between them.[33] Whilst DNA profiles between related individuals will show a number of common bands, and this proportion rises to high levels between siblings and descendants, the likelihood that two samples will match by chance is still extremely low. Under ideal conditions, the probability of two samples matching by chance is estimated to be less than one in thirty billion or one in five to six times the present population of the earth.[34]

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[32] Allen R.W., Bliss B. and Pearson A. 'Characteristics of a DNA Probe (pa 3HVR) When used for Paternity Testing' 1989 26 TRANSFUSION 477, at 481.

[33] Dodd B.E. 'DNA Fingerprinting in Matters of Family and Crime' 1985 318 NATURE 506, at 506.

[34] Brown L. STATE OF THE WORLD IN 1987 (London 1987: Oxford University Press) 5.

Based on their performance of the test, Lifecodes calculates that with four DNA probes the probability of matching by chance is less than one in one hundred million and using five probes, the likelihood of a coincidental match is less than one in one billion. (Baird M., Giusti A., Shaler R. et al. 'The Application of DNA-Fingerprints for Identification from Forensic Biological Materials' 1988 2 JOURNAL OF FORENSIC HAEMOGENETICS 396, at 396.)

3.3 THE DNA DATABASE

We come now to what is probably the most important and an integral aspect of DNA profiling as a forensic identification test, namely the requirement of a comprehensive database containing information and identification of highly polymorphic DNA sequences and analyses of all allele frequency distributions of polymorphic DNA loci in the various groups and sub-groups of the population.

As has been repeatedly stated, in paternity disputes, the DNA testing process involves the matching of the blood of the child with the blood of the putative father. If the DNA does not match, then the alleged father cannot be the individual sought. If the suspect's DNA matches the DNA obtained from the child, then the next step is to establish the likelihood that the DNA from a randomly chosen person of the same racial and ethnic background might also match that of the child. The reason for this is that whilst the overall DNA pattern of every individual (barring identical twins) will be unique, specific alleles are common in several, sometimes all, the members of the popualtion being investigated. Therefore, the specific bands produced on an autoradiograph will only be of probative value if their frequency of occurrence in the particular population is known[35], for the autoradiograph represents the DNA profile

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[35] Beeler L. and Wiebe W.R. 'DNA Identification Tests and the Courts' 1988 63 WASHINGTON LAW REVIEW 903, at 926.

for only a segment of the entire strand. The only way to determine the frequency of each band's presence (or "fragment frequency")is by extensive sampling in the general population.

The further requirement that the general population be divided into first its racial groups which must then be divided into their individual ethnic components is very important. For the information in the database to be truly valuable and effective, the frequency of a particular allele in each of the ethnic groupings investigated must be calculated. This latter breakdown and analysis of the societal composition is desirable for the very fact that it has been noted that various ethnic groups do often exhibit differing frequencies of occurrence for a particular allele.[36] In a study conducted by Baird et al. (for the HRAS-1 polymorphism), they found that whilst the number of allele observed in the different ethnic groups was very similar, the relative frequency of occurrence of each varied significantly.[37]

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[36] The term 'allele' is used here to mean 'alternate genes capable of occupying a single location on a chromosome'.

[37] Baird M., Balazs I., Giusti A. et al. 'Allele Frequency Distribution of Two Highly Polymorphic DNA Sequences in Three Ethnic Groups and its Application to the Determination of Paternity' 1983 39 AMERICAN JOURNAL OF HUMAN GENETICS 489, at 489.

For example, the putative father was an Asian Indian living in the Durban area. The alleged father has exhibited positive DNA profile bands in common with the child concerned. The effect of a comprehensive, ethnic-specific database would be to demonstrate

The method of calculation is that the scientist compares the alleged father's DNA to that found in a laboratory database containing DNA samples of at least 100 men of similar racial and ethnic background. He then calculates the frequency with which the suspect's DNA profile is found in the relevant population.[38] The database frequency is then multiplied in accordance with well-accepted population genetics theories to obtain a statistical likelihood that the suspect is, in fact, the biological father of the child.[39]

The evidentiary value of a database was demonstrated in the New South Wales case of R v Tran[40]. The accused was a Vietnamese male living in Sydney, charged with the crime of rape. The bands in the DNA profile of the semen sample

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whether these positive DNA markers were commonly distributed among the Asian, more especially the Indian, population in Durban. The rarer the bands among that population, the less likely that the match with the putative father could be coincidental. In other words, the frequency in which the bands occur in the population will assist in determining whether a particular profile presents overwhelming, as opposed to less compelling but still valuable, proof of identity: Beeler L. and Wiebe W.R. op. cit. Note 35 supra, at 926.

38 Byne A.A. 'Using DNA Evidence to Prove Paternity: What Attorneys Need to Know' 1992 19 FAMILY LAW REPORTS 3001,at 3001.

39 Thompson W.H. and Ford J. 'DNA Typing: Acceptance and Weight of the New Genetic Identification Tests' 1989 75 VANCOUVER LAW REVIEW 45, at 45; and Jackson P. 'DNA Fingerprinting and Proof of Paternity' 1989 15 FAMILY LAW REPORTER 15, at 15.

40 Unreported judgment. See McLeod N. 'English DNA Evidence Held Inadmissable' 1991 CRIMINAL LAW REVIEW 583.

removed from the body of the victim and analysed by Cellmark laboratories appeared to match the bands of the DNA profile of the sample taken from the accused, Tran. The next step, therefore, was to look at the database to gauge the frequency with which these bands would be prevalent in the Oriental, especially Vietnamese, community in Sydney. From the evidence it appeared that Cellmark did not have any data relating to the South-East Asians. Consequently, they based their frequency calculations on a database made up of 300 Afro-Caribbeans.[41] In cross-examination it was put to Dr Preston, the analyst from Cellmark, that the calculated frequency would surely be affected by the racial composition of the database. Whilst initially conceding that it could have a "slight effect", he later reverted to the view that the racial composition of the database would not affect the findings given that the probe used in casu was MS1.[42]

However, counsel for Tran was able to produce concrete evidence demonstrating the fact that Cellmark's own Asian database (when using the same probe) had given a probability of one in two hundred, whilst their Caucasian database (for the same probe) a probability of one in three hundred and forty-three. The disparity appeared to prove his point. To quote McImerney J., as he rejected the conclusions and evidence of the Cellmark analyst, '... the

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[41] McLeod N. 'English DNA Evidence Held Inadmissable' 1991 CRIMINAL LAW REVIEW 583, at 589.

[42] Ibid.

state of the evidence is in an unsatisfactory state because of the fact that there is no database for **Vietnamese.**'[My emphasis]. The learned judge went on to say that it was therefore not possible to categorically conclude that the semen belonged to Tran and not some other Vietnamese male.

In light of all the foregoing, it appears that a comprehensive database is an integral aspect of DNA profiling. Until one is established, South African laboratories performing DNA profiling will find their results frequently rejected by the courts. According to Mr Ravi Reddy, of the Durban bloodbank, they have already started accumulating their samples and already have 'a few hundred'. However, he does not believe that this is even close to the final number they hope to achieve to ensure the absolute reliability and trustworthiness of the findings.[43] According to Steve Reavis, their main laboratory in Observatory classifies people simply as black, white and coloured.[44] Now, the argument is, do the fragment frequencies generated by this database apply to members of subpopulations, in other words, do the frequencies generated from a database which contains the fragment sizes for the white population apply equally to an individual of Dutch origin and an individual of English

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[43] Telephone conversation with Mr Ravi Reddy of the Blood Transfusion Services, Durban Bay House, Smith Street, Durban.

[44] Correspondence with Mr Steve Reavis of the Provincial Laboratory for Tissue Immunology, Observatory, Cape, dated 6 January 1994.

origin? Reavis believes not and consequently notes that for the South African population, when one considers the incredible number of different subpopulations, this becomes a serious problem which must be met before evidence provided by their laboratory will be ready for acceptance by the courts.

CHAPTER FOUR

THE ENHANCED VALUE OF THE DNA PROFILE TEST OVER THE CURRENT, MORE COMMONLY-USED, TESTS FOR IDENTIFICATION

4.1 INTRODUCTION: CERTAINTY VERSUS PROBABILITY

Despite many refinements in the testing of blood during the latter part of this century, the veracity of the statement that '... proof of paternity must rest on probability' has never been previously doubted.[1] Conventional blood tests can, at most, only play a negative role in regard to the issue of proving paternity. In other words, by comparing the blood groups of the mother, child and alleged father, the only absolute, certain conclusion that we may attain is that the alleged father CANNOT be the father of the child. The HLA system of tissue typing may establish paternity with a far higher degree of probability than is possible utilising only the red blood cell test. In Van der Harst v Viljoen,[2] Watermeyer J. described the nature and value of the red blood cell and HLA tests in the following way:

> Until fairly recently the only tests which were done were on the red blood cells by the use of anti-sera, and three systems were used to classify the blood, namely, the ABO blood grouping system, the MNS system and the Rhesus system. The tests done in the present

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[1] Dodd B.E. 'When Blood is Their Argument' 1980 20 MEDICAL SCIENTIFIC LAW 231, at 232.

[2] 1977 (1) SA 795(C), at 796.

case showed that the child's father must have possessed genes which produce blood group factors O and S, and the chances of finding these two blood group genes together in any one individual from the White population group in South Africa are approximately one in five. Defendant does possess such genes.

In recent years, and more particularly since it was decided to do organ transplantation in this country, it was found necessary to employ a more sophisticated system whereby the tissues could be more accurately identified and matched, and the HLA system of tissue typing, which is based on the white blood cells, was adopted. As I understand it, the gene is the biologic unit of heredity, and genes are located in a definite position, or locus, on the chromosomes. Tests are not done for the genes themselves, but for what are known as antigens, and every person has two HLA antigens of the A locus and two of the B locus, each A antigen being combined in haplotypic combination with a B antigen. Every human being has inherited one haplotype (i.e. one A antigen in combination with one B antigen) from each parent. In the present case the child has the haplotype A1/B16 which he inherited from his mother, and the haplotype A29/B7 which he inherited from his father. Defendant has the antigens A29 and B7 and tests done on defendant's father show that these two antigens were inherited by the defendant in one haplotype.

... Dr Briggs expressed the view that ... the putative father, in this case the defendant, is 210 times more likely to be the true father than someone else taken at random. Applying the Essen-Moller formula the degree of probability is 99,85 per cent, which is an extremely high degree of probability.

... Dr Briggs agreed with the views expressed and said that although the defendant could not positively be

> proved to be the father of the child the chances of the plaintiff picking someone at random as the father with the right antigens would be 200 to 1 against.

Contrary to the glowing acceptance of the court of the HLA test in Van der Harst v Viljoen, I am, however, forced to agree with the sentiments of Böhm and Taitz that irrespective of the degree of probability, the conclusion will always remain nothing more than a probability.[3]

So, when all is said and done, the more commonly-used, conventional tests still cannot conclusively prove paternity - conventional tests will merely help to establish the probability that someone is the father. The issue for the courts then remains: What degree of probability is necessary? And the question concomitant to this issue is: Who assesses what degree of probability is acceptable?

The results of the conventional blood tests are produced in terms of a statistical probability. In his report the serologist will indicate whether a person is excluded from being the father of the child in question, or, if he is not, the value of the tests in establishing paternity. While it will always be for the expert serologist to explain the blood test, it is the practice for the court to

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[3] Böhm L. and Taitz J. 'The DNA Fingerprint: A Revolutionary Forensic Identification Test' 1986 103 SOUTH AFRICAN LAW JOURNAL 662, at 665.

make the final decision about what these explanations mean. The rationale of our legal system is that the courts are only guided by expert opinion and never bound by it. This gap between expert evidence and the final determination can have very unfortunate results, for as Ormrod L.J. observed in Re J.S.[4]:

> The concept of "probability" in the legal sense is certainly different from the mathematical concept.[5]

An English case has clearly illustrated this problem. In Serio v Serio,[6] the serologist analysed the blood samples. To establish the degree of probability that Mr Serio was the father of the child, he used the Essen-Möller equation, together with the appropriate tables. His conclusion drawn from the tabular proof was not useful as a significant indicator of paternity, he said. The court, however, disregarding the discussion of the serologist, accepted that the figures presented by the serologist simply represented the percentage of the population not having the combination of genes possessed by Mr Serio. They, mero motu, decided that the tests did, in fact, establish legal probability. In the light of such misunderstanding and judicial bias by the courts one cannot but agree with Bradney when he writes:

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[4] (1981) 2 FLR 146.

[5] Ibid, at 151.

[6] [1983] 4 FLR 756.

> Although it is for the courts to decide what is legal probability, when expert evidence is sifted and some fruits of expertise accepted and others rejected, litigants may grow wary of an arbitrariness in the court's approach. If courts appear to misunderstand the full subtlety of the evidence, yet still select those parts that will be accepted, that wariness may grow into positive distrust.[7]

However, as has been noted several times in this study, recent scientific advances have completely altered the nature of blood testing. The new tests developed are based on the unique nature of human DNA. Each person's DNA is, as has been explained earlier, in Chapter 3, different from that of any other person. Given the unique nature of a supposed parent's DNA, it is possible to establish, not whether the putative parent <u>may</u> be the parent, but rather, whether he or she <u>is</u> the parent.[8] What is being tested here are the

> ... inherited variations of the structure of the DNA that makes up the genes. [These] results will] provide a specific way to establish unique sequences that specifically identify the parents of a child.[9]

The results of the DNA profile test give '... unequivocal

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[7] Bradney A. 'Blood Tests, Paternity and the Double Helix' 1986 FAMILY LAW 378, at 379.

[8] Whilst DNA profiles also produce evidence based on a probability of relationship, these probabilities can be so high that they are accepted as providing a certainty of relationship.

[9] Polesky H.F.and Lentz S.L. 'Parentage Testing: An Interface Between Medicine and Law' 1984 60 NORTH DAKOTA LAW REVIEW 727, at 733.

evidence of relationship...'.[10] In the American case of Mastromatteo v Harkins[11], HLA tests demonstrated a 99.4% probability of paternity. Whilst acknowledged to be highly probative evidence that Harkins was the father of the child, the court felt that it was not "dispositive " or "definite" proof of paternity. However, a DNA profile test was able to provide evidence of the fact that H possessed all 17 bands that were found in the DNA of M's child. On this information, the court had no hesitation in holding H to be the biological father of the child and consequently, responsible for the concomitant legal obligations. The test is, therefore, now no longer one of probability, but rather, one of certainty. Such a capability has the potential to render otiose many of the problems facing the courts with regard to the interpretation of serological evidence. Questions of probability of paternity no longer seem relevant, and if the child's paternity can be firmly established, it is more difficult for anyone to deny the desirability of the test. With the introduction of the DNA profile test, the question of paternity should soon become a matter not for the courts to decide, but rather, one for scientific laboratories.

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[10] Jeffreys A.J., Brookfield J.F.Y. and Semeonoff R. 'Positive Identification of an Immigration Test Case Using Human DNA Fingerprints' 1985 317 NATURE 818, at 819.

[11] 1992 19 FAMILY LAW REPORTER 1037.

4.2 THE USE OF DNA PROFILE TESTS ON DIZYGOTIC TWINS TO ESTABLISH PATERNITY

An article in the Sunday Times newspaper reported "An incredible medical fluke". Apparently, in a recent case, a twin brother and sister were born as only a half-brother and sister.[12] Usually, the physiology of the woman is such that only one of the many eggs produced per month can be fertilised at a time. However, in this case, two of the eggs produced by the woman were fertilised during the same menstrual cycle. According to the reporter, she had engaged in sexual relations with both her husband and her lover on the same day. As chance would have it, one egg was fertilised by the lover and the other by the husband on the same day. When the twins were born, the alleged father refused to acknowledge that he had fathered twins. DNA profiling conclusively indicated that he was only the father of the boy. The mother subsequently admitted her affair and it was shown that the daughter was the offspring of the lover. Without the unassailable proof of the DNA-profile test, the matter would have been decided on 'probabilities' and the 'best interest of the child' principle. In such a case, both approaches surely carry the potential for an alleged father to be unfairly burdened with paternity of a child not his own.

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[12] Sunday Times Reporter New York 'Twins Fluke Reveals Wife's Affair' 12 January 1992 SUNDAY TIMES 28.

This case clearly demonstrates the probative value of the results of the DNA profile tests in cases of disputed paternity.

4.3 USING THE DNA PROFILE TESTS TO ESTABLISH PATERNITY WHEN THE PUTATIVE FATHER IS UNAVAILABLE FOR TESTING

The value of the evidence provided by DNA profiling is incalculable especially in those areas of the law dealing with inheritance and succession rights. For example, in a case where the deceased has left a will wherein he provides for the distribution of his assets '... to all my children'. Patently, in such a case, even children born out of wedlock, who are proved to be the children of the deceased, would be entitled to claim from the estate of the deceased. Such a problem was presented to the Family Blood Grouping and Immunogenetics Laboratory at the Medical College of Virginia, Richmond, Virginia and reported by Odelberg et al. in the JOURNAL OF FORENSIC SCIENCES 1988.[13] Their brief was to provide proof that the illegitimate child, now requesting a share of his alleged father's (now deceased) estate, was, in fact, his offspring. The way in which they set about achieving proof was to obtain a DNA profile from the deceased's parents, as many of his

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[13] Odelberg S.J., Demers D.B., Westin E.H. and Hossaini A.A. 'Establishing Paternity Using Minisatellite DNA Probes When the Putative Father is Unavailable for Testing' 1988 33 JOURNAL OF FORENSIC SCIENCES 921, at 921.

siblings who were available for testing, the child and the mother. To ensure absolute certainty, two independent probes were used when obtaining the DNA profiles.

The basis of the results was the probability of band sharing. All fragments present in the child's pattern but absent in the mother's are obligatory paternal bands, and thus must be carried by at least one of the alleged paternal grandparents if the deceased is the biological father of the child.

In the case under observation, the first probe indicated twenty-three bands of known paternal origin. All of these fragments were present in either the alleged paternal grandfather or grandmother. It was calculated that the chance that at least one of two unrelated grandparents would carry one of the necessary fragments was 0,45 and the probability that at least one of two unrelated grandparents would carry each of the twenty-three fragments would be $(0,45)^{23} = 1.1 \times 10^{-8}$. Further, the probability that a random man could share the twenty-three fragments with the child and thus be a possible father was $3,5 \times 10^{-14}$.

Utilising the second probe, eighteen paternal bands were ascertained and all these bands were present in, at least, one of the alleged paternal grandparents. The probability of unrelated grand parents sharing these fragments with the child was $(0,45)^{18} = 5,7 \times 10^{-7}$ and likewise the probability

that a random man would share the eighteen fragments with the child and thus be a possible father was $2,9 \times 10^{-11}$.

Faced with such incontrovertible evidence, the family of the deceased reasonably agreed to settle the dispute out of court.

The American case of Tipps v Metropolitan Life Insurance Co.[14], was based on a similar issue. The plaintiff claimed to be the natural offspring of the deceased and consequently, entitled to a share of the proceeds of an insurance policy on the decedent's life. DNA profile tests were conducted on the decedent's parents, a biological son and the plaintiff. From the evidence provided by the tests the District Court, South Texas concluded that, "The tests ... provided clear and convincing evidence that the decedent was not the biological father of the child." In the absence of any relationship, the court found that the plaintiff's claim was unfounded.

Clearly, therefore, we may conclude that the minisatellite DNA probes provide conclusive evidence of paternity even when the alleged father is, himself, unavailable for testing.

In the South African case of Ex Parte Emmerson the situation arose where the alleged father, though strictly

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[14] 1991 17 FAMILY LAW REPORTER 1320.

speaking, not unavailable for testing, was, nevertheless, deceased. The facts of the case were as follows:
The applicant was seven-and-a-half-months pregnant when the man, whom she alleged to be the biological father of her unborn child, was killed in a motor accident. The mother brought an urgent application to court for an order authorising and directing the release of skin and/or blood and/or muscle samples of the deceased by the officer in charge of the mortuary where the body of the deceased was being kept to a doctor employed by the South African Institute of Medical Research. The application also contained a request for an order to be granted, which order would authorise the aforesaid doctor to perform certain tests, namely, appropriate DNA profiling tests in order that the paternity of the unborn child could be ultimately determined.

The deceased was a man of considerable wealth and the mother wished to establish the veracity of his paternity in order to subsequently entitle her to claim maintenance for the child against the estate of the deceased. The Court, per Schutz J., granted the order.

Similarly, in Batcheldor v Boyd[15], the North Carolina Appeal Court upheld an order that a boby be exhumed for DNA testing to determine the inheritance rights of a man claiming that the decedent, who was not his mother's first

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[15] 1992 19 FAMILY LAW REPORTER 1115.

husband, was his biological father. Noting that the Superior courts had fully recognised "the general acceptability of DNA evidence", the court, in casu, had little hesitation in allowing the application.

Patently, the procedures to be adopted in Emmerson's case and Batcheldor's case is quite different from that envisaged in the earlier part of the discussion on this issue for the earlier study provides a viable solution based on the premise that the possibility of actually obtaining a physical sample from the alleged father is nil. In Emmerson's case and Batcheldor's case, for purposes of obtaining a DNA profile, we could say that, for all intents and purposes, the father was available for testing and consequently, the prescribed procedures adopted when testing the ordinary mother - child - alleged father triad would be followed.

4.4 THE USE OF DNA PROFILING IDENTIFICATION TECHNIQUES ON ABORTED FOETAL MATERIAL

'An unmarried mother is compelled, for medical reasons, to abort her foetus. She wishes to claim for hospital and other related expenses from the father.'

The problem in this example will be to establish the paternity of the aborted foetus.

In every act of conception, the genes from the father become part of the genetic makeup of the resulting foetus. In such cases, therefore, genetic testing, other than the DNA profiling test, may be performed to provide evidence of paternity.[16] However, Reisner et al. were of the informed opinion that this type of testing is only really conclusive with foetuses over six months of age where the HLA test is being used.[17] They subsequently conducted a study to examine tissue from twelve aborted foetuses. The genetic tests used were the HLA test, red cell or red cell enzyme tests alone or in combination. Their results may be considered somewhat satisfactory but were in no way conclusive. It was found that the red cell enzyme test could not be used on all samples and could only reasonably and properly be conducted in certain instances. They also determined, it would appear, that red cell antigen testing would not work out at all where there were too few cells or too few cells could be retrieved. The HLA test only proved satisfactory in one-third of the cases tested.

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[16] Reisner E.G., Clark A.R. and Shoffner, J.C. 'Tests of Genetic Markers on Aborted Fetal Material' 1988 33 JOURNAL OF FORENSIC SCIENCES 1262, at 1262.

[17] Ibid. Presently, most reported cases of prenatal genetic testing deal with human lymphocyte antigens (HLA) testing using amniotic cell samples or chorionic villus materials: Callaway C., Falcon C., Grant G., et al. 'HLA Typing with Cultured Amniotic and Chorionic Villus Cells for Early Prenatal Diagnosis or Parentage Testing Without One Parent's Availability' 1986 16 HUMAN IMMUNOLOGY 200, at 200; Pollack M., Schafer I.A., Barford D. and Dupont B. 'Prenatal Identification of Paternity. HLA Typing Helpful After Rape' 1980 244 JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION 1954, at 1954.

These results proved nothing new but simply substantiated the already known fact that it is possible to test foetal tissue for genetic markers. However, for our purposes, what was interesting to note were the number of technical difficulties experienced when employing or attempting to employ the conventional tests. Firstly, where the two alleged fathers were closely related, the tests could not exclude either. Thus, a pending paternity dispute, which was dependent on the findings of the tests, resulted in a dismissal because, in addition to the test results being inconclusive, the mother was mentally incompetent to testify.[18] Secondly, Reisner, Clark and Shoffner found that the sample size and the tissue type, as well as the time elapsed since the abortion were critical points in determining success or failure.[19] Type and size of the foetal tissue sample obtained are primarily controlled by the gestational age of the foetus. Reisner et al. also believe that the method of abortion will determine the type and size of foetal tissue obtained.[20] They consider that an optimal sample would consist of foetal blood obtained by heart puncture, a procedure which they acknowledge is only possible in older foetuses. It has been argued that red

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[18] Op. cit. Note 12 supra, at 1263. Compare this to the case of S v Haynes: In casu, in Pierce County, Washington, Alan J. Haynes, a bus driver was convicted of raping one of his passengers through the use of DNA evidence. The victim was afflicted with Alzeimer Disease and could not identify her attacker: New York Times (Magazine) 6 November 1988, at 70.

[19] Op. cit. Note 12 supra, at 1264.

[20] Ibid.

blood cells can be recovered in younger foetuses from clots but the origin of such material is always suspect. There is no telling whether this material is really foetal or maternal in origin.

The alternative to a foetal blood sample is possibly the use of foetal spleen or tissue cells teased from the muscles of the limbs. The problem encountered using the HLA test on teased muscle is that almost invariably there will be a high background level of killed cells, making antigen definition extremely difficult.[21]

In practice, where the foetus is not naturally expelled, most very young foetuses are aborted using suction procedures. This technique, generally, does not produce intact material or material whose origin is easily defined. Consequently, to quote Reisner et al.:

> For the [aforementioned reasons] we have concluded that testing foetuses younger than ten weeks has too high a failure rate to be useful.

They go on to predict, however, that:

> ... the acceptance of deoxyribonucleic acid (DNA) testing for parentage determination ... will make the process of prenatal paternity testing easier and more exact.[22]

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[21] Ibid.

[22] Ibid, at 1265. See also People v Bailey 140 Misc 2d 306, as discussed by Taitz J.L. 'DNA-Fingerprinting as a Forensic Identity Test - A Reappraisal' 1992 109 SOUTH AFRICAN LAW JOURNAL 270, at 275-6.

Clearly, the problems that beset the conventional tests do not present themselves when analysing the DNA profile test results of blood samples.[23]

4.5 THE USE OF DNA PROFILING TO ESTABLISH MATERNITY

The DNA profile test has already been used successfully to establish maternity in a dispute between the British immigration authorities and an immigrant. In summary, the facts of the case were as follows:

A young Ghanaian boy, born in England, had emigrated to Ghana to join his father. Some years later, the boy (whom I shall name B) returned to England to reunite with his mother (whom I shall name M), a brother (B2) and two sisters (S1 and S2). The immigration authorities, however, refused him entry on the grounds that the boy might be the son of M's sister who was still living in Ghana or was even some entirely unrelated boy seeking to enter the United Kingdom illegally. Conventional markers indicated a probability of non-relationship between M and the boy (B) of 0,01 - a result, the authorities concluded, which could not rule out the possibility that the woman M was not the mother but the aunt of the boy, B. Further complications arose from the fact that neither the father nor M's sisters

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[23] Chapter 3 supra.

were available for testing. This was compounded by the fact that the mother was, herself, uncertain about the boy's paternity. A DNA profile, following the Jeffreys' technique, was prepared from blood samples of the woman M, the brother (B2), the two sisters (S1 and S2) and the boy (B), himself. Although the father was unavailable, the bulk of his DNA profile could be reconstructed from paternal specific DNA fragments present in at least one of B's siblings whose paternity was certain and which were absent in the mother. Based on the results of the tests, Jeffreys calculated that the chance of a non-relationship between B and M was 7×10^{-22}. In order to decide whether M or an unrelated woman could be the mother of B, Jeffreys made use of the fact that the DNA profile of B contained maternal fragments of which approximately twenty-five were specifically inherited from the mother. The chance that M was unrelated to B but happened to show all twenty-five fragments was calculated to be 2×10^{-15}. The probability that one of M's sisters, none of whom were tested, could be the mother of B and by chance contain all twenty-five of B's maternal specific bands was shown to be 6×10^{-6}. Jeffreys, therefore, concluded beyond reasonable doubt that M must be the true mother of B.[24] Presented with such irrefutable data, the immigration authorities had no alternative but to grant the boy residence.

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[24] Jeffreys A.J., Brookfield J.F.Y. and Semeonoff R. op.cit. Note 9 supra, at 818-9; Böhm L. 'Advances in Forensic Medicine' 1987 71 SOUTH AFRICAN LAW JOURNAL 276, at 276-7 ; Böhm L. and Taitz J. op.cit. Note 3 supra, at 668-9.

CHAPTER FIVE

POTENTIAL PROBLEMS WITH THE DNA-PROFILE TEST AND RESOLUTION THEREOF

5.1 DIFFICULTIES CAUSED BY THE PHYSIOLOGICAL PROCESSES OF OXIDATION, MUTATIONS AND CROSS-OVERS WITHIN THE CELL

There is one other very important additional factor which must be considered when analysing DNA samples to establish paternity. Amongst serologists conducting the analyses of the DNA profile, it has been the general practice to exclude a male from paternity if he has been found not to have made a contribution to the genome of the child for any one genetic trait. There are, however, exceptional conditions in which a male who is, in fact, the father of a particular child, might, in a DNA analysis procedure, be found not to have provided an expected DNA sequence.

The first possibility arises as a result of the meiotic process, particularly during the process of crossing over.[1] The process

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[1] For a fuller and illustrative discussion on meiosis and the crossing-over process, see Leeson T.S. and Leeson C.R. HISTOLOGY (Philadelphia 1981: W.B. Saunders Co.) at 65, 67, 73-4; Smit and Van Dijk INTRODUCTION TO MODERN BIOLOGY (Durban 1980: Maskew Miller) 46-8, 566, 576-7; and see generally Dupraw E.J. DNA AND CHROMOSOMES (New York [1970]: Holt, Rinehart and Winston Inc).

is quite natural and normal and is, in fact, very frequent. According to Dr Lawrence Kobilinsky and Dr Louis Levine:

> In studies of human spermatocytes, the average number of cross-overs seen is about 50, which is slightly more than two cross-overs per synapsed homologous pair of chromosomes. What is rather obvious then is that a cross-over and result in the inheritance in the off-spring of a somewhat different DNA sequence than would have been inherited had no cross-over event taken place. If it should happen that a cross-over event takes place at a site where restriction enzyme cleavage would normally occur, the analysis of DNA from this individual would provide a banding pattern different from that expected based upon analysis of parental DNA. Thus, regardless of the number of probes used, the alleged father would be excluded from paternity based upon the child's banding pattern.[2]

A second possibility of incorrect exclusion of the biological father in a disputed paternity case can result from a mutation in a spermatogonial cell during the meiotic maturation of the spermatozoa which contributed to the conception of the child.

Chehab et al. believe that advanced paternal age predisposes to spontaneous mutation, especially in sperm DNA.[3] This is significant because mutation during spermatogenesis can result in the generation of a new paternal allele not represented in the peripheral white blood cells of the father. Therefore, again,

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[2] 'Recent Application of DNA Analysis to Issues of Paternity' 1988 33 JOURNAL OF FORENSIC SCIENCES 1107, at 1107.

[3] Chehab F.F., Winterhalter K.H. and Kan Y.W. 'Characterisation of a Spontaneous Mutation in Beta-Thalassaemia Associated With Advanced Paternal Age' 1989 74 BLOOD 852, at 853.

one finds a different DNA composition in father and child and a potential situation of exclusion where, in fact, the alleged father is the real father.

Also, according to Linda Dahl, there is always the possibility that the body has manufactured 'free radicals'.[4] A 'free radical' is an energetic molecule which, when exposed to oxygen, quickly reacts with other compounds to form more free radicals, producing a chain reaction in which the structure of the affected cells can be disrupted or destroyed. The theory exists that these free radicals and their by-products can alter cell components such as DNA. So, the father of last month may not necessarily be the father of this month!

Finally, Allen, Bliss and Pearson recognise that, although highly discriminatory, this method of identification worked out by Alec Jeffreys can yield maps that are a) difficult to interpret owing to the large number of fragments visualised in each gel lane but, more importantly, they say that b) due to the large number of fragments under consideration in each assessment, there is always the possibility of error in band assignment.[5] As stated earlier, the Jeffreys' test is conducted such that a single probe simultaneously detects polymorphic restriction fragments originating from a number of independent polymorphic loci. This

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[4] 'Free Radicals Clearing up the Confusion' 1989 July SHAPE 29.

[5] 'Characteristics of a DNA Probe (pa 3 HVR) When Used for Paternity Testing' 1989 26 TRANSFUSION 477, at 482.

is believed to be possibly the primary cause of the errors mentioned by Allen, Bliss and Pearson. In the United States, however, an alternate method has been implemented which apparently renders otiose this particular problem. It is also referred to as DNA profiling, but it involves the use of a limited collection of probes so that alleles at a single, highly polymorphic locus are visualised, one locus at a time. It has been noted that this approach, when used in conjunction with as few as five probes, can be as discriminatory as the multiloci analysis, and the results are more easily interpreted.[6]

Spontaneous mutation remains a field still shrouded in mist and, only as recently as 1989, Chehab et al. recognised and described the spontaneous mutation which can cause beta-thalassaemia and distinguish an offspring's DNA profile from that of a parent.[7] Only at this point in time did knowledge of such a molecular lesion come to light and scientists can now finally understand the frameshift mutation that presents itself in future generations.

Further under investigation was the possibility that environmental contamination could affect the results by leading to the creation of a false positive. If this were so, then the reliability of the DNA profile tests would surely be placed under suspicion because the sample could conceivably inculpate an

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[6] Ibid, at 483.

[7] Chehab F.F., Winterhalter K.H. and Kan Y.W. op. cit. Note 74 supra, at 853.

innocent suspect, or conversely, exonerate a guilty one, which would, obviously, defeat the entire purpose of electing to apply DNA-profile tests over the present conventional methods. Fortunately, researchers believe the most likely sources of false positive results to be bacterial or viral.[8] Baird et al. believe that the presence of foreign DNA may be detected by the use of 'screening' probes, which alert scientists to the presence of bacteria and ensure that the sample DNA is of human origin.[9] Because foreign DNA can be detected, it follows logically that it will not affect the reliability of the DNA profile test.[10]

The effects of environmental contamination on DNA samples have, however, not yet been fully detailed. Consequently, to negate concerns that environmental contamination could produce false results, a reasonable suggestion would be the continued empirical testing of environmental factors on samples. This would assist to delineate more clearly the limits of the DNA profile tests and to devise controls for the environment factors which could affect analysis. Experts from commercial laboratories and the academic community, however, presently believe that this further empirical testing will simply serve to confirm the reliability of the DNA

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[8] Beeler L. and Wiebe W.R. 'DNA Identification Tests and the Courts' 1988 63 WASHINGTON LAW REVIEW 903, at 921.

[9] Baird M., Giusti A., Shaler R. et al. 'The Application of DNA-Fingerprints for Identification From Forensic Biological Materials' 1988 2 JOURNAL OF FORENSIC HAEMOGENETICS 396, at 398.

[10] It is very important to note, however, at this point, that in general, DNA is a stable substance, particularly when compared to the existing protein or antigen genetic marker systems used in current tests.

profile test.[11] Dr George F. Sensabaugh of the University of California's School of Public Health, believes that further empirical testing will not produce 'any surprises' affecting the reliability of the DNA profile tests.[12] "It's foolproof," believes the South African Police forensic expert, Christo Weitz.[13]

In an interview conducted by Beeler and Wiebe, Dr Michael Baird stated that, in two thousand paternity tests, no bands found in the offspring's DNA were attributable to mutation.[14] Jeffreys, Wilson and Thein agree that the mutation rates within an individual, at those portions of the DNA strand recognised as being stable, are extremely low (of the order of 0,001-0,004 per locus per gamete).[15]

For DNA analysis to be reliable and accepted by the courts, it should not bear any potential to produce false results, that is, for example, results which indicate a band where none should have appeared. Having considered the foregoing problems and solutions, together with the positings of various experts, it

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[11] Moss 'DNA - The New Fingerprints' 1988 74 AMERICAN BAR ASSOCIATION JOURNAL 69, at 69.

[12] Sensabaugh G.F. 'Forensic Biology - Is Recombinant DNA Technology in its Future?' 1986 31 JOURNAL OF FORENSIC SCIENCES 398, at 400.

[13] Stansfield M. op. cit. note 56 supra.

[14] Beeler L. and Wiebe W.R. op. cit. Note 79 supra, at 921 N93.

[15] 'Individual Specific "Fingerprints" of Human DNA' 1985 316 NATURE 76, at 78.

would appear that such potential problems, as those canvassed above, will arise as the extreme exception rather than the norm.

5.2 COSTS

5.2.1 The Cost of the DNA Profile and the Cost of Setting-Up an Adequate Laboratory

One potential problem with the DNA profile test pertains to the question of costs. According to a spokesman from the South African Blood Transfusion Services, Mr Ravi Reddy, the cost of a conventional set of tests, that is, red blood cell and tissue typing, is R990,00.[16]

In England, until 1989, the DNA technology was exclusively available on a commercial basis from Cellmark Diagnostics, a subsidiary of Imperial Chemical Industries based in Oxfordshire.[17] Fees payable for the service were 105 pounds plus VAT per blood sample tested in cases up to four blood samples and in a typical paternity dispute where a father-mother-child trio is tested, the fee was, consequently, 315 pounds plus VAT.[18]

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[16] Telephone interview, on 27 November 1991, with Ravi Reddy who is in charge of the paternity laboratory at the Blood Transfusion Services in Durban Bay House, Smith Street, Durban. (Tel: 784311).

[17] McColl M. and Walsh E., eds., 'DNA Fingerprinting to the Fore' 1988 18 FAMILY LAW 114, at 115.

[18] Ibid; Bevan H.K. CHILD LAW (London 1989: Butterworths) 74.

Yet, only a year earlier, Imperial Chemical Industries was of the opinion that the cost of testing a mother-father-child trio in its laboratories would be approximately 600 pounds (sterling), that is, 200 pounds for each sample tested.[19] The obvious conclusion that one can draw from this apparent reduction in cost over the period of just one year is that, as scientists continue to develop and improve on the test, and as they become more familiar with procedures, the present high costs will begin to reduce concomitantly.

Many antagonists would argue against the implementation of the DNA profile test on the grounds that the higher costs could place it beyond the reach of many persons. Against this argument, what one needs to evaluate are the enormous financial (and emotional) consequences that could otherwise attach to a falsely accused man. Therefore, it is my submission that any laboratory that performs parentage testing procedures should not execute a testing programme that limits such tests on the basis of cost. If they do, they will continue to wallow in the quagmire of probabilities whilst the rest of the world forges ahead into the age of certainty in paternity analysis. What must be understood at all times is that the lower cost of the conventional tests may translate into high support costs for an individual who has been falsely accused because of inferior testing procedures.

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[19] Böhm L., Taitz J.L. and Van Helden P. 'The Implementation of DNA Fingerprinting as a Forensic Identification Test in South Africa' 1987 104 SOUTH AFRICAN LAW JOURNAL 307, at 310.

Applying the presently-used conventional techniques, one may sometimes attain a cumulative chance of exclusion (CCE) of more than ninety-nine per cent.[20] However, the remaining 0,9 per cent will always be vital and untold. The cumulative chance of exclusion increases proportionately to the number of genetic systems involved in the programme. Using only the red blood cell and human lymphocyte antigen tests, the CCE value could move rapidly up to ninety to ninety-five per cent and then easily to ninety-nine per cent by including a few more systems of red blood cell enzymes and serum proteins. But to go above ninety-nine per cent, an addition of more than twenty systems may be needed.[21] Each test would obviously have to be paid for, and still one would be left with nothing more than probabilities. In contrast, the DNA testing programme using the DNA profile technique can be employed to achieve virtual certainty. It will absolutely eliminate all inconclusive results and save time and money spent upon repeated tests and courtroom testimony.

Moreover, whilst the DNA profile test will, in all instances, provide a certainty of parentage, it should be noted that there is no need to involve oneself every single time in such expensive proceedings. It is, therefore, recommended that the disputing parties always be offered the alternative of conventional testing procedures with the proviso that if the results are doubtful,

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[20] Supra, at Chapter 2.

[21] Boonlayangoor P.W., Telischi M. and Paulsen M.D. 'Paternity Blood Testing: Analysis, Interpretation and Selection of a Program to Verify Parentage' 1987 75 ILLINOIS BAR JOURNAL 278, at 282.

then the samples will be submitted for DNA profile tests.

5.2.2 Who Should Bear the Cost of the DNA Profile Test

One of the means of preventing false accusations and vexatious denials is for the courts to establish the precedent whereby a party to the dispute, who is found to be lying, shall be ordered by the court to bear the full costs of the suit arising from his/her untrue allegation or denial, as the case may be. Bearing in mind the high costs involved, this should greatly reduce the potential problem of women lying to save a marriage or unmarried women embarking on fishing expeditions to land the best catch.

Similarly, an alleged father who believes that he is, in fact, the real father of the child will be less likely to deny paternity to avoid the duty of support and maintenance if he knows that, once the essence is separated from the dross, he will be traced with certainty and made to bear the costs occasioned by his attempted evasion.

In this way, then, the problem of high costs may be converted into a positive factor reducing the number of malicious and vexatious actions. Unquestionably, the DNA profile test systems, once adopted, will be used more often to better serve science and justice.

CHAPTER SIX

THE CURRENT STATUS OF THE SOUTH AFRICAN LAW, AND THE POWER OF THE COURT TO COMPEL ANY PERSON TO SUBMIT TO IDENTIFICATION TESTS IN PATERNITY DISPUTES

6.1 INTRODUCTION

Chronologically, the recent development of the South African case law and legislation relating to the establishment and attribution of paternity is not difficult to trace. For the purposes of this study, the researcher will outline the South African law prior to the case of Seetal v Pravitha and Another NO[1], and then progress to a discussion of the case, itself. This will be followed by an examination of the Children's Status Act 82 of 1987 and, finally, the case law subsequent to Seetal v Pravitha and Another NO, namely M v R[2], Nell v Nell[3], S v L[4] and O v O[5].

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1 1983 (3) SA 827 (D).

2 1989 (1) SA 416(O).

3 1990 (3) SA 889(T).

4 1992 (3) SA 713(C).

5 1992 (4) SA 137(C).

6.1.1 The South African Law Prior to the Case of Seetal Versus Pravitha and Another NO 1983 (3) SA 827(D)

Apart from the uncertain value of the conventional paternity tests, a further problem that often arose during paternity disputes was that, prior to the case of Seetal v Pravitha and Another NO[6], there existed in our law no means to compel the co-operation of the alleged father, the mother and her child.

The evidential value of blood tests in disputed paternity matters is well reported in the South African Law reports.[7] However, the power to procure such a test has posed quite a problem because it rested on the tenuous basis of the consent of the mother, the alleged father (or fathers) and the guardian of the child concerned. Unless all these parties were prepared to co-operate, the important evidence yielded by such a test, often vital for a decision reflecting the real truth about paternity, would never reach the court despite its ready availability. Since the parties involved are usually already at arms length and such evidence could irreparably damage the case of one of the parties involved, absolute co-operation is the exception rather than the rule.

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[6] Op. cit. Note 1 supra.

[7] E v E and Another 1940 TPD 333; Ranjith v Sheela and Another NO 1965 (3) SA 103(D); Van der Harst v Viljoen 1977 (1) SA 795(C).

6.1.2 Seetal v Pravitha and Another NO 1983 (3) SA 827(D)

The fact that the production of available and vital evidential material should depend wholly on the co-operation and consent of the disputing parties is clearly unsatisfactory, especially since the various presumptions that apply in paternity cases may well place the mother in a superior legal position.[8] The inevitable challenge to this iniquitous state of affairs was raised in the case of Seetal v Pravitha and Another NO where the court was presented with the problem and had to decide whether it (and any subsequent court) had the authority to compel an unwilling party to undergo a blood test.[9]

In casu, the applicant sued the first respondent for divorce citing as his grounds her alleged adultery. The applicant further requested an order of court declaring that the four-year-old son of the respondent, conceived after her marriage to the applicant and whilst they were living together on intimate terms was illegitimate. In the papers before the court, the applicant had maintained that the child was the product of the aforementioned adultery. The sole basis of the averment of illegitimacy was the difference in physical features between the applicant and the child.

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[8] See Chapter 1 supra.

[9] Op. cit. Note 1 supra.

Since physical similarity or dissimilarity is regarded by our courts as being of the little evidential value,[10] it was essential that the applicant obtain other, more reliable proof to rebut the presumption of pater est quem nuptiae demonstrant. Because of the fact that the spouses had been on intimate terms at the relevant time of conception, the applicant's only real chance of success lay in disproving paternity through some kind of forensic test (or tests). At the time, the most informative tests, being applied in South Africa, would have been a series of the conventional blood tests and subsequent comparison of the affinity of blood groups of the three persons involved. The first respondent refused to submit herself or her son, who was in her custody, to such a test. Consequently, the applicant made an application to court for an order directing her to comply. The application was opposed by the wife, as first respondent, and a curator ad litem, on behalf of the child, as second respondent.

The issue which the court had to decide, therefore, was whether or not it had the necessary powers to compel any person - adult or child - to submit himself, or herself, to a blood test.

With regard to adults, the court recognised its common-law power to compel such persons to submit to a blood test, but that this did not mean that they were obliged to do so

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[10] Mountford v Mukukumidzi 1969 (2) SA 56[RA], at 58.

in every case.[11] In coming to this conclusion, Didcott J. took a different view to that expressed by the court in E v E and Another where the court categorically denied the existence of such a power.[12] It is respectfully submitted that, of the two differing opinions, the conclusion reached in Seetal v Pravitha and Another NO is clearly more correct in this respect for it is trite that the Supreme Court does have the necessary common-law authority to order the search for and discovery of evidence so that the truth will emerge and justice prevail in litigation.[13]

To quote Vieyra J. in Ex Parte Millsite Investment Co (Pty) Ltd[14]:

> The inherent power claimed is not merely one derived from the need to make the court's order effective and to control its procedure, but also to hold the scales of justice where no specific law provides directly for a given situation.[15]

In the end, however, the debate about compulsory blood testing amounts, essentially, to a showdown between two ideas, namely, the idea that the truth should be discovered whenever possible and the idea that personal privacy should

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11 Op. cit. Note 1 supra, at 832-3.

12 Op. cit. Note 7 supra,at 335.

13 Kemp K.J. 'Proof of Paternity: Consent or Compulsion' 1986 49 TYDSKRIF VIR HEDENDAAGSE ROMEINS-HOLLANDSE REG 271,at 285.

14 1965(2) SA 582 (T).

15 Ibid, at 585 H.

be respected. Both are important but neither is sacrosanct. The resolution of this debate will depend, largely, upon the store the court sets by each idea, on its own sense of priority in this regard.[16] In casu, however, the court did not deem it necessary to express a favour for either belief the matter before it already having been settled. The question, therefore, still remained whether or not the law could, and would, justify the invasion of the privacy of a person who refused to voluntarily submit to blood testing in order to establish the truth about a child's paternity.

With regard to children, Didcott J. recognised the role of the Supreme court as upper guardian of all minors. He even went so far as to say that in this capacity, the court may authorise a blood test on a child and may even go so far as to override any refusal by the custodial parent and consent on the minor's behalf.[17] The sole consideration in making

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16 Seetal v Pravitha and Another NO op. cit. Note 1 supra, at 861.

17 Ibid, at 862.
But what is the source of such a notion? Let us examine the Common law: Historically, under the **German law**, a child was under the 'munt' of his/her father. According to Huebner, this authority originally included the power of life and death over the child, the right to sell a child, and to compel the marriage of a daughter: Philbrick F.S.(translator) A HISTORY OF GERMANIC PRIVATE LAW BY RUDOLF HUEBNER (New York 1968: Sentry Press) 657. However, alongside the rights of the father, the German law also recognised that the courts had a right of supervision and control over all children - 'obvormundschaft': Philbrick ibid, at 659.

such a decision, however, is always the best interest of the child, ruled Didcott J. As stated by his Lordship:

Unlike the Roman law, **Roman-Dutch law** never really embodied the notions of patria potestas. According to Wessels, the Roman-Dutch law rather followed German customs in this regard: Wessels J.W. A HISTORY OF ROMAN-DUTCH LAW (Grahamstown 1908: African Books Company) 417. Specifically on this topic, Grotius notes that originally it was the princeps, but later the court, who was vested with the 'obvormundschaft' over all minors.

In summary then, we have a Roman law notion of patria potestas which would imply that parental power does not permit any interference which is not wanted, and a second rule of Roman-Dutch law (probably developed under German influence) that the State (translate to read Supreme Court) is the upper guardian of all minor children: Spiro E. LAW OF PARENT AND CHILD (Cape Town 1985: Juta and Co) 257.
Now, it is not inconceivable that these rules will clash. A close examination of the case law indicates that when this happens, there is a firm rejection of the first rule in favour of the second: see Van Rooyen v Werner (1892) 9 SC 425; Calitz v Calitz 1939 AD 56; Goodrich v Botha and Ano 1952 (4) SA 175(T); Ex Parte Simpson 1953 (1) SA 565(A); Short v Naisby 1955 (3) SA 572(D); September v Karriem 1959 (3) SA 687(C); Ex Parte Misselbrook NO 1961 (4) SA 382(D); Edge v Murray 1962 (3) SA 603(W); Mashaoane v Mashaoane 1963 (3) SA 604(N); Bylieveldt v Redpath 1982 (1) SA 702(A). What has clearly emerged from the case law is that the Supreme court, in its capacity as upper guardian of all minors, may, in fact, deprive a parent of any of the incidents of the parental power if such deprivation may be justified under the circumstances of the case. The effect, therefore, is that where a parent unreasonably, more particularly, contrary to the interests of the child, withholds his/her consent at a time when such consent is required, or in some other fashion fails in his/her duties to best represent the child, the court as upper guardian may interfere with the parental power in such manner as would best suit the interests of the child: Spiro ibid, at 116. In exercising its authority, the task of the court is to ascertain the existence of a danger to the life, health, morals, property etc. of the child. Thus, it emerges that the oft used term 'best interests of the minor' refers not only to material welfare, but to physical well-being as well as economic, social, moral and religious considerations.

> I am unwilling to follow the decision on the point of the House of Lords in S v S; W v Official Solicitor, ... which held the child's interests to be merely relevant to but not paramount in such a case. Indeed, I disagree firmly with it, and the judgments along the same lines ... I do not even share the view Ormrod J. expressed when In re L came before him, the view that the child's interests, though paramount, were "not the exclusive consideration". To my mind, they are all that matter. They are decisive ... I do not see how the conclusion can be avoided ... that it must act in the interests of the child and take account of nothing else ... The child alone is its responsibility.[18]

Didcott J. pointed out that the idea that the truth must be discovered to ensure that justice prevails cannot always be accepted in its unqualified form as the guiding principle. He said that policy demanded that the truth be discovered only by approved means. Since the single-minded pursuit of truth may sometimes cause harm to a person subjected to it, together with an emergence of the truth, the harm occasioned by the manner of truth seeking must always be weighed against the idea that the truth must out.[19]

In casu, therefore, whilst recognising the probative value of blood tests, Didcott J. ruled, 'I am not satisfied that it would benefit the first respondent's child were I to allow a blood test on him'[20]: avoiding, thus, the

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[18] Op. cit. Note 1 supra, at 863-4.

[19] Ibid, at 832-3.

[20] Ibid, at 865.

possibility that the child could be left with no identifiable father. Accordingly, the application was refused and the applicant's obligation to support the child financially continued.

In summary, then, the reasoning of the Honourable Court in Seetal v Pravitha and Another NO may be summarised as follows :

1) With regard to a major, Didcott J. believed that before the court exercised its authority and compelled him/her to submit to a blood test, two competing interests, namely, the idea that the truth must be discovered, and the idea that personal privacy must be respected, should be weighed and balanced. In casu, his Lordship believed that it was not necessary for him to state a preference and the issue remained a vexed one,[21] and

2) as far as minors are concerned, Didcott J. maintained that the Supreme Court, as the upper guardian of all minors, can authorise the taking of a blood sample from the child but in so acting, it must act in the interests of the minor and take account of nothing else.[22]

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[21] See later discussion on the case of M v R at p.118 et sec.

[22] Ibid.

6.1.3 The Children's Status Act 82 of 1987

After a careful consideration of the case of Seetal v Pravitha and Another NO, the researcher is of the opinion that in the final analysis perhaps all the intricate legal arguments have obscured what is perhaps the most important consideration in the "compulsion versus consent" debate regarding blood and genetic tests in paternity cases, namely, that often the real reason a party refuses to submit to the test is simply that he (or she) fears the truth. This point is, in fact, reiterated in section 2 of the Children's Status Act 82 of 1987 which reads as follows:

> If in any legal proceedings at which the paternity of any child has been placed in issue it is adduced in evidence or otherwise that any party to those proceedings, after he has been requested thereto by the other party to those proceedings, refuses to submit himself or , if he has parental authority over that child, to cause that child to be submitted to the taking of a blood sample in order to carry out scientific tests relating to the paternity of that child, it shall be presumed, until the contrary is proved, that any such refusal is aimed at concealing the truth concerning the paternity of that child.[23]

Unfortunately, this is the full extent of the South African law governing this issue. Consequently, section 2 may be interpreted as providing nothing more than a principle of

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[23] This section is clearly broadly worded enough to also encompass the performance of DNA profiling.

evidence, notwithstanding the fact that the Law Commissioners conducting the enquiry into the legal position of children born out of wedlock were of the opinion that, firstly, there existed a need for a legal rule and, secondly, that a purely evidentiary rule would not sort out the uncertainty shrouding such issues.[24]

It would appear that the legislation failed to fully incorporate the suggestions of the Law Commission, namely,

> ... that the most satisfactory solution is to be found in legislation indirectly compelling the parties to co-operate of their own accord to determine parentage by means of blood tests. (My underlining)

The presumption created by section 2, however, can, at most, only have persuasive, and never compulsive, effect. The possibility exists that the confusion arose out of the fact the words 'indirectly' and 'compel' did not fully support each other. Consequently, the 'consent - compulsion' debate was still not satisfactorily resolved.

Further, as section 2 stands, recalcitrant parties in a paternity suit do have the legal right to attempt to justify their refusal to undergo blood testing. One of the most fundamental arguments which could be raised is the

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[24] See the report of the South African Law Commission - PROJECT 38 INVESTIGATION INTO THE LEGAL POSITION OF CHILDREN BORN OUT OF WEDLOCK - 1985, at 70.

fact that all the test would indicate is a probability of fatherhood and if the probability value were high enough, the 'probable' father would then be made responsible for the financial maintenance of the child. In assessing what is 'high enough', the courts will often mero motu make their decision.[25] The chance exists that he could be made liable for pecuniary support based on nothing more than a probability. Consequently, his refusal to submit to the tests. Irrespective of how high that degree of probability, the fact is that all the present tests can show is that he is probably the father. The only time that liability would be acceptable is if there were certain proof of paternity, or, at least, an incontrovertibly high probability.

Now, if DNA profiling were used, providing as it can an almost absolute proof of paternity, the principle behind section 2 of the Children's Status Act 82 of 1987 is greatly enhanced. Any person refusing to submit to the test, except in exceptional circumstances, does so because he has a real fear of the truth, knowing that this test will link him undeniably to the child. Whilst DNA profiling also provides a result based on probabilities, such probabilities are so great that they are often described as ascribing paternity 'as a certainty'. Consequently, it would be very difficult, if not impossible, to deny fatherhood in such instances.

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[25] See Serio v Serio supra, at p.82.

It would appear that the legislation does not build very well on the tests currently being used in South Africa because of their lack of "certainty" but it clearly would accord with the implementation of DNA profiling because of the inherent characteristic of the latter test to provide positive and absolute identification of the person/s undergoing it.

6.1.4 The South African Case Law Subsequent to the Case of Seetal v Pravitha and Another NO[26]

In the case of M v R[27], the Supreme Court, in the Orange Free State, was required to adjudicate the issues of (a) whether an illegitimate minor child, and (b) his mother, could be compelled to submit themselves to blood tests, in order to establish the paternity of the child in question? The argument raised by the applicant was that it would constitute a gross injustice if he were ordered to maintain another man's child.

The first question is clearly one of jurisdiction. Does the court have the right to overrule the wishes of the custodian and order that a minor submit to blood tests? On this point, Kotze J. found himself in complete accord with the thinking of Didcott J. in Seetal v Pravitha and Another

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[26] Op. cit. Note 1 supra.

[27] Op. cit. Note 2 supra.

NO[28]:

> A South African Court, ..., can thus consent on a child's behalf to the removal from him of a blood sample which is wanted for diagnostic or therapeutic purposes. There is no reason, ..., why it should not ... grant the requisite consent when the sample is required for forensic purposes instead. ....
>
> ... [I]n order to investigate paternity, a South African Court can authorise a blood test on a child despite any objection to one registered by the parent caring for and controlling the child, and ... it can overrule the objection ....[29]

In deciding whether or not to authorise such a test, Didcott J. felt that the only consideration of the court had to be the best interest of the child. Kotze J. refused to align himself with this trend of thought, maintaining that a very important factor was being overlooked, namely, the search for the truth and the fact that the truth must be revealed. The test, he felt, should be that the minor's interests are not the only factor but rather one of the factors which must be considered.

> Dit is my mening dat die toets ... moet wees ... dat die minderjarige se belang nie die enigste nie maar wel die deurslaggewende of oorheesende rigsnoer, waarteenoor alle ander oorwegings 'n ondergeskikte rol speel

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[28] Op. cit. Note 1 supra.

[29] 'Court' in this passage is a reference to the Supreme Court alone. See M v R op. cit. Note 2 supra, at 420 and Seetal v Pravitha and Another NO op. cit. Note 1 supra, at 862-3.

....[30]

Such a finding is clearly in keeping with the intentions of the Commissioners working on Project 38.[31]

The court acknowledged that the absence of an identifiable father could cause a hardship to the child. However, where, to avoid such a handicap, a man was compelled to maintain a child not his, this would surely not constitute an 'advantage' that should be taken into account and protected by the court.[32]

These sentiments expressed by Kotze J. have been strongly approved by Barnard, Cronje and Olivier. They maintain:

> In our view the judge was correct in not being impressed with the argument that the child would be left with no identifiable father if the blood tests should prove that the applicant was not his father. ... Judge Kotze was also correct in not accepting the argument that the child might lose the maintenance he was receiving if the blood tests should prove that the applicant was not his father. According to the judge this is not a very strong argument as **money that is wrongly taken from a man who is not really the child's father, is not a "benefit" that should be taken into account and protected by the court.[My enphasis]**[33]

With regard to the application for an order compelling the

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30 M v R op. cit. Note 2 supra, at 421.

31 Op. cit. Note 24 supra.

32 M v R op. cit. Note 2 supra, at 422.

33 Cronje D.S.P. THE SOUTH AFRICAN LAW OF PERSONS AND FAMILY LAW (Durban 1986: Butterworths) 68.

mother to submit herself to the taking of blood samples, the court reasoned as follows:
It is trite that the general jurisdiction of the Supreme Court comprises the courts common law jurisdiction, statutory jurisdiction and an inherent jurisdiction. The common law did not know of blood tests, and there is no statute which empowers a civil court to compel a person to submit to blood tests.[34]

Whilst noting that the parameters of inherent jurisdiction were yet undefined, Kotze J. acknowledged the guidelines presented by Taitz.[35] In discussing the content of the Court's inherent jurisdiction, Taitz notes that it

> ... should be seen as those (unwritten) powers, ancillary to its common law and statutory powers, without which the Court would be unable to act in accordance with justice and good reason. The inherent powers of the Court are quite separate and distinct from its common law and statutory powers ... .[36]

Concluding that the ordering of blood tests fell within the ambit of the procedural law, Kotze J., therefore, felt that it would fall within the inherent authority of the court to make such an order. The court, consequently, granted the order compelling the respondent to submit herself and her minor son to the taking of a blood sample.

In Nell v Nell[37], Le Roux A.J. disagreed with the reasoning

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[34] The most recent legislation on blood tests, section 2 of the Children's Status Act 82 of 1987, completely failed to resolve this problem. See at pp.130-3 supra.

[35] M v R op. cit. Note 2 supra, at 423.

[36] Taitz J.L. THE INHERENT JURISDICTION OF THE SUPREME COURT (Cape Town 1985: Juta and Co.) 8-9.

[37] Op. cit. Note 3 supra.

of Kotze J. in M v R[38] on the question of whether or not the ordering of blood tests constituted a matter of procedural law. Assuming that it did, then his Lordship saw no argument with the court's claiming the authority to order persons to submit to same. He did not dispute the inherent authority of the Supreme Court to regulate its own procedures. However, he was not satisfied that the ordering of blood tests was not, in fact, a matter of substantive law, and as such, he ruled that the court would be acting ultra vires its authority to create a principle of substantive law which would infringe the rights of privacy of the individual. Accordingly, the application was refused.

S v L[39], also turned on the question of whether the courts could compel an adult and/or a minor to submit to the taking of blood samples.

The appellant had requested an increase in maintenance payable by the respondent. This was opposed by the respondent, who stated that despite earlier payments of maintenance, he had not, at no stage, admitted paternity of the child. At this juncture, he requested that the parties submit themselves to blood testing procedures to settle the issue beyond doubt. The appellant refused. An application was made to court to compel the appellant and her minor

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[38] Op. cit. Note 2 supra.

[39] Op. cit. Note 4 supra.

daughter to present themselves for the taking of a blood sample in order that blood and blood tissue tests could be conducted. The purpose was to determine the paternity of the child. This order was granted by Burger A.J. in the court a quo. The mother took the matter on appeal.

In casu, Mullins J. concurred with the beliefs of Le Roux A.J. in Nell v Nell[40], averring that the ordering of a blood test did not constitute a procedural matter. It was his submission, therefore, that the court did not have the power to compel any person to have a blood sample taken.[41]

Further, and specifically with regard to minors, his Lordship was of the opinion that although the court is the upper guardian of all minors, it nevertheless does not enjoy the power to interfere with and/or override a decision of the child's guardian in instances where the latter has decided that the child should not undergo blood tests.[42]

In a more recent decision on the subject, O v O[43], the court recognised that with regard to children, it could in

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[40] Op. cit. Note 3 supra.

[41] Compare with Rule of Court 36(1) which is discussed infra, at p.146 N58.

[42] Compare this to the submissions of the courts in Seetal's case op. cit. Note 1 supra, at 862, and M v R op. cit. Note 2 supra, at 420.

[43] Op. cit. Note 5 supra.

the exercise of its power as upper guardian authorise a blood test on a minor despite objections by a custodian parent.[44] However, in making such a decision, the court must take note of the best interests of the child. Apparently, Friedman J.P. was of the view that this was the sole criterion for consideration before making such a determination. The notion that the 'truth must out and justice be served' (as noted in M v R)[45], was not discussed.

In casu, the court held that it was clearly not in the interests of the child that blood tests be done. Consequently, there was little reason to consider the court's authority to order a non-consenting adult (in this instance, the mother) to undergo a blood test in order to establish paternity. This issue thus remains unresolved.[46]

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[44] Ibid, at 139.

[45] Op. cit. note 2 supra.

[46] As his Lordship noted, at 139

> Whether the Court has the power to order a non-consenting adult to undergo a blood test in order to establish paternity is by no means as clear cut as the Court's power in the case of a minor. There is no statutory or common-law power enabling the Court to order an adult to allow a blood sample to be taken for the purpose of establishing paternity. The question whether the power to make such an order falls within the Supreme Court's inherent jurisdiction is a disputed one. See Seetal's case (op. cit. note 1 supra), M v R

6.2 A BRIEF LOOK AT THE HANDLING OF THIS ISSUE BY TWO OTHER FIRST WORLD JURISDICTIONS, NAMELY, ENGLAND AND THE UNITED STATES OF AMERICA

6.2.1 The English Law

In the English case of McV v B[47], the mother brought a complaint in the magistrate's court alleging that the appellant was the father of her child. The magistrate presiding decided that blood tests should be taken. The appellant refused to comply with the direction, indicating that he would be unwilling to take a blood test. The magistrate, consequently, accepted the mother's evidence and found that the appellant had failed to comply with the blood test direction without a reasonable explanation. The court accordingly drew the obvious conclusive adverse inference that he had failed to comply because he had had sexual intercourse with the mother and knew that the blood test would show that he was probably the father of the child. It adjudged that the appellant was the father of

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(op. cit. note 2 supra), Nell v Nell (op. cit. note 3 supra) ...
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Refer also to S v L (op. cit. note 4 supra).

[47] 1988 18 FAMILY LAW JOURNAL 290.

the child. The appellant appealed.

The judge of appeal, Wood J., said that one of the questions posed for the decision of the court was whether the magistrate had been correct to draw an adverse inference from the appellant's failure to comply with the direction that he submit himself to a blood test.

The pertinent statutory provisions were found in sections 20 and 23 of the Family Law Reform Act of 1969. Section 23(1) provides that where a court had given a direction under section 20 of the Act (in terms of which **a court may order a party to submit to blood tests**) and any person (or persons) failed to comply with the direction, "... the court may draw such inferences, if any, from that fact as appears proper in the circumstances."

Accordingly, the Appeal Court held that the magistrate had been justified in the circumstances of the present case in drawing such an adverse inference from the appellant's failure to comply with the direction and had not erred in the exercise of his discretion.

However, for our purposes, what is particularly relevant is the fact that the English law has an explicit statutory provision, in the form of section 20, which allows the **court** to order/compel any party to submit himself/herself to a blood test. Consequently, whilst section 23 of the

Law Reform Act of 1969 appears similar in direction to section 2 of the Children's Status Act 82 of 1985[48], section 23 has greater efficacy, supported, as it is, by section 20 of the same Act. Thus, in order for section 2 of the Children's Status Act to have a similar effect, the legislation would need to be extended to include an authority similar to that existing in section 20 of the English Law Reform Act of 1969.

6.2.2 The Law in the United States of America

In State of South Dakota v Damm[49] it was held that

> ... a trial Court of record in this State has inherent power and authority, in its reviewable discretion, to order the taking of blood for such purposes in cases where paternity is an issue and where, in the opinion of the Court, the making and reporting of such test will be, or is likely to be, helpful in ascertaining the truth.[50]

In the case of State of Ohio ex Van Camp v Welling[51], an order compelling the mother to allow blood to be taken from herself and the child for testing was granted. According to Conn J.

> When we adopt the maxim that for every legal wrong there is a remedy, we must also apply the corollary that every

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[48] Infra, at p.130.

[49] (1936) 266 NW 667.

[50] Ibid, at 670-1.

[51] 1983 22 Ohio L Abs 448.

> remedy shall be founded on truth and justice. Ways and means for the ascertainment of truth are not statistical. The value of scientific research, and the truth thus revealed, ought to be available to the courts. If this be true, then the courts must have the power, soundly exercised, to bring the light of scientific research and knowledge to bear upon the issues of fact as a further aid in arriving at the truth and in doing complete justice. If this be unsound, then the courts in the application of the remedial law may fail to keep abreast of the march of progress, and thereby fail to command uniform confidence and respect. **It is no answer to say that there is a lack of express authority, unless we conceive that the law is static and lacks the merit of an expansive flexibility, both in respect to the recognition of rights and their invasions, and in respect to the power of the court to discover and apply methods of ascertaining the truth whereby the remedy may be appropriate and coincide with justice.**[52] [My emphasis]

The Appellate Division of the Supreme Court of New Jersey allowed an appeal against the refusal by a lower court to grant a husband the order he wanted for a blood test on his wife and child. The wife was claiming maintenance for the child, whom he did not accept as his own. Brenan J., in Cortese v Cortese[53], spoke thus:

> In the absence of ... special circumstances we think the demonstrated utility of this tool of evidence should move trial courts in civil actions to employ it freely.[54]

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[52] Ibid, at 841-2.

[53] (1950) 76 A 2d 717.

[54] Ibid, as quoted in Seetal v Pravitha and Another NO op. cit. Note 1 supra, at 843.

And in Beach v Beach[55], decided by the United States Court of Appeals for the District of Columbia, the presiding officer, Edgarton J., declared:

> If the child is the appellant's, the test will prove nothing to harm no one. If the child is not his, **it would be unjust to prevent him from proving the fact.**[56][My emphasis]

Apparently, in many States in the U.S.A., the courts have had little difficulty in ordering non-consenting adults to submit themselves for blood tests even in the absence of a specific statutory directive. In S.S. v E.S.[57], the court went even further holding that a paternity court has the power to require the incarceration of a defendant who refuses to submit to court-ordered blood testing where such an order is based on mare than "merely conclusory allegations" of the defendant's paternity. The court based its decision on its concern regarding the unnecessary delay in paternity proceedings (a very real problem that is faced in South Africa), and urged that a hearing on a request for blood tests should not become a "mini-trial". Recognising the drastic nature of this step, the went on to declare that it was confident that no trial court would arbitrarily infringe any person's privacy but that trial judges would be sensitive to the need for a delicate balancing of a defendant's privcy rights with the significant public

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55 1940 114 F 2d 479.

56 Ibid, at 482.

57 1991 17 FAMILY LAW REPORTER 1411.

interest in an expeditious determination of the issue.

The remarkably progressive attitude of the American courts is highly visible. Maybe this area of family law should be revisited by the South African judiciary the next time the issue arises.

6.2.3 Conclusion

Comparing the laws in South Africa with that of the United Kingdom and the United States of America, it appears that the South African law - both the case law and prevailing legislation - has shied away from absolutely recognising the real probative value of blood tests. Kemp, however, maintains firmly that a court is legally entitled to compel persons to submit to blood tests. He goes even further to state that should a party fail to heed the order to submit to a blood test, his case, whether as plaintiff or defendant, should simply be dismissed on the basis of a conclusive adverse inference.[58]

Boberg appears to be of a similar opinion saying,

> One can only agree with Darrol when he says that
> the Courts should have the authority to order blood tests in paternity cases, and continues:
>
> "Our courts in a century so respectful of scientific fact, disregard a means of clear and authoritative evidence.... Instead, they choose to grope in the

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[58] Kemp K.J. op. cit. Note 12 supra, at 285-6. Compare with section 23 of the English Law Reform Act of 1969.

> confusing uncertainties of circumstance. Critical comment of this practice has been legion. It has been labelled 'slightly silly' employed by 'ostrich-minded courts'."[59]

This unfortunate shortcoming may be remedied once DNA profiling is accepted and applied in paternity dispute cases.

6.3 DOES AN ORDER COMPELLING A PERSON TO SUBMIT TO FORENSIC TESTING UNLAWFULLY VIOLATE HIS/HER RIGHT TO PERSONAL PRIVACY?

The question which still needs to be fully canvassed is whether or not the court, when making an order compelling an individual to submit himself/herself to blood tests, does not invade that individual's right to privacy and bodily integrity? If answered in the affirmative, what then should be the paramount consideration - one's right to privacy or the idea that the truth must be revealed?

Light must not be lost of the fact that the taking of a blood sample, albeit, in most instances, no more harmful or painful than a pinprick, technically constitutes an invasion of the person's legal right to his/her privacy.[60]

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[59] Boberg P.Q.R. THE LAW OF PERSONS AND THE FAMILY (Cape Town 1977: Juta and Co.) 332.

[60] In Enyon v Du Toit 1927 CPD 76, which was a claim for damages for personal injuries, the court held that it had no power to make an order directing a plaintiff to submit himself to a medical examination required by the defendant. There is now a procedure provided by Rule of Court 36(1), sanctioned in terms of section

However, it is difficult to accept that a mother would stand firm by her right to privacy when an issue so important and fundamental to her child is being placed in issue, unless, of course, she has something to hide.

After much consideration, the researcher is of the opinion that the only plausible answer to this question has to be that in an ordinary paternity dispute, where money is often the main consideration, hiding the truth could result in the extortion of monies that may not be due. On a party-to-party basis, the protection of the child's interest can never justify the protection of a possible falsehood simply so that the child will have a source for money at his/her disposal.

If medical science were still only at the stage of the unsatisfactory proofs afforded by the conventional blood tests, one could perhaps accept the rejection of the application, in cases like Seetal's, Nell v Nell and S v L. However, with the advent of DNA profiling, the person indicated by the test as the father, is, without doubt, the father. This clearly obviates the real and totally unfair possibility of one being made to support and maintain a child born of he seed of another. It is my submission, therefore, that in paternity disputes, preference must now

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43(3) of the Supreme Court Act 59 of 1959, requiring plaintiff to submit to such an examination.

be given to the truth[61]; tests should be ordered as a matter of course unless the unwilling party proves exceptional circumstances favouring the preservation of personal privacy: Provided, of course, that DNA profiling has become commercially available in South Africa as a means for establishing paternity.

Usually, however, the parties are already in open court often enquiring into and exposing the most intimate details of each other's personal lives. Past affairs,impotence,and sexual habits are all aired in the court. The inherent infringement of privacy in compelling a blood test surely pales into insignificance next to these issues, especially if we accept that such a test will obviate the need for the humiliating experience of having to undergo a searching examination of one's personal and intimate habits by strangers. Consequently, it is difficult to accord a high priority to the defence of privacy in cases of paternity. It is, therefore, submitted that reason favours an order compelling parties to undergo blood tests combined with DNA profile tests in disputed paternity matters. This is particularly underscored when one considers the serious consequences for the innocent defendant.

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[61] See Labuschagne E. 'Toegangsregte van die Natuurlike Vader tot sy Buite-Egtelike Kind' 1990 4 TYDSKRIF VIR DIE SUID-AFRIKAANSE REG 778, at 784-5.

In his book, THE LAW OF PRIVACY IN SOUTH AFRICA,[62] McQuoid-Mason notes:

> In the United States where such test (bloodtests) are in the interests of minor children, the Courts appear to recognise that they do not constitute an invasion of privacy. There seems to be no reason why such a principle should not be applied in our law.[63]

To this, Kotze J. adds:

> Gevalle waar dit reeds al geverg is dat die reg op privaatheid van die eie liggaam moet wyk voor die groter ideaal om die waarheid te dien is ook nie onbekend aan ons reg nie.[64]

The researcher is of the opinion that this is an almost inevitable conclusion.

A fortiori, it would appear that the discovery of truth should enjoy precedence over the infringement of the right to privacy, and if it is accepted that the primary function of a court is to dispense justice according to the law of the land on an equal basis to all parties appearing before it, then the law should avoid exhibiting any unfair bias or unjust preference.[65]

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[62] McQuoid-Mason D.J. THE LAW OF PRIVACY IN SOUTH AFRICA (Cape Town 1978: Juta and Co.).

[63] Ibid, at 163.

[64] Op. cit. Note 2 supra, at 427.

[65] For a possible exception to this proposed rule of law, see Chapter 1 N15 supra, on the issue of introducing a statute of limitations in certain cases.

In Mastromatteo v Harkins[66], the Pennsylvania Supreme Court acknowledged the right of the individual to be free from the burden of blood extraction but opined that this right must always be balanced against the entitlement of children to know their fathers. Rather than serving to harass the alleged father, all parties and the interests of justice would be served by allowing the most accurate method of paternity testing to be performed on the parties in casu. It was, consequently, the finding of that court that in the application of this balancing test, the right to have the most definitive determination of paternity available to all parties in this case outweighs the minimal intrusion necessary to accomplish this task.

6.4 DOES AN ORDER COMPELLING A FORENSIC TEST VIOLATE THE PRIVILEGE AGAINST SELF-INCRIMINATION?

Having concluded firstly, that the Supreme Court in South Africa does have an inherent authority to compel any person to submit to a forensic test and, secondly, that on the grounds of equity and justice they should exercise this inherent reservoir of power within the parameters of the law against all persons, another question must be answered, and that is: does an order compelling any adult person to submit himself or herself to a forensic test violate his/her privilege against self-incrimination? The South

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[66] 1992 19 FAMILY LAW REPORTER 1037.

African law on privilege and self-incrimination in civil disputes is to be found in the Civil Proceedings Evidence Act of 1965 and also the Natal Law to Amend the Law of Evidence Act of 1870.

Section 3 of the Natal Law to Amend the Law of Evidence Act of 1870 provides:

> No witness whether a party or not in any proceeding in any court of justice shall be liable against his or her wish to be asked or bound to answer any question tending to show that he or she has been guilty of adultery or other stuprum. Provided always that the aforegoing part of this section shall not apply to any woman who shall be seeking to affiliate an illegitimate child of hers ....

Quite apparently then, a mother seeking to establish the paternity of her child could not shield behind any privilege and was, consequently, obliged to answer all questions, even where they did tend to show that she had been guilty of an adulterous relationship.

However, the Civil Proceedings Evidence Act of 1965 repealed this section but made no other provision for the privileges against answering questions tending to show adultery or stuprum. Section 42 of the Civil Proceedings Evidence Act of 1965 does, however, contain the following provision:

> The law of evidence ... which was in force in respect of civil proceedings on the thirtieth day of May, 1961,

> shall apply in any case not provided for by this Act or any other law.

The effect of section 42 thus appears to be a resurrection of any and all the laws in existance as at the 30th day of May 1960, the contents of which had neither been repealed nor amended by a subsequent Act. Consequently, Zeffert is of the opinion that section 3 of the Natal Law to Amend the Law of Evidence Act of 1870 has not, in actuality, been repealed and, probably, continues to exist by virtue of section 42 of the Civil Proceedings Evidence Act.[67] Simply, what this means is that by virtue of section 42 Natal is still bound by the old Act.

Thus, in Natal, all other persons, except a mother seeking to affiliate her illegitimate child, are still protected by the privilege against answering questions showing or tending to give evidence of an adulterous relationship. Therefore, as far as the mother is concerned, the absence of any privilege renders the original question otiose.

In Natal, such a privilege would, however, apply to any man who is alleged to be the father of the child in question. Therefore, he may not be obliged to answer any question tending to show that he has been guilty of adultery or other stuprum. Could he then argue that subjection to a forensic test may be equated to providing evidence of adultery or stuprum and, consequently, refuse to submit to

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[67] Zeffert D. THE SOUTH AFRICAN LAW OF EVIDENCE (Durban 1988: Butterworths) 246.

the test?

Beeler and Wiebe maintain that, in the face of the existence of any privilege against self-incrimination in such matters, the drawing of blood samples after a court order based on probable cause for the purposes of conducting a forensic test would still, nevertheless, not constitute a violation of the individual's privilege because such evidence would only be physical and not testimonial evidence.[68] This is certainly also the conclusion of the researcher after a careful examination of section 3 of the Natal Law to Amend the Law of Evidence Act of 1870.

6.5 CONCLUSION

Zeffert describes Didcott's judgment in the Seetal case as being:

> A judgement of rare erudition, of an almost exhaustive comparative sweep, and of probing and closely reasoned analysis.[69]

Whilst there cannot be anything but absolute agreement with the praise lavished on the quality of the judgment, the decision, itself, clearly cannot be supported in all

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[68] Beeler L. and Wiebe W.R. 'DNA Identification Tests and the Courts' 1983 63 WASHINGTON LAW REVIEW 903, at 921.

[69] Zeffert D. 'Blood Tests in Paternity Suits' 1984 101 SOUTH AFRICAN LAW JOURNAL 62, at 62.

aspects. Even high quality reasoning can be flawed and opinions legitimately differ on the clearly controversial issues that the court had to decide.

In Seetal v Pravitha and Another NO, Didcott J. said that whatever might be thought nowadays about the stigma of illegitimacy, a topic on which any confident assertion would be unwise in a heterogeneous society like ours with its variety of cultures and religions, it must amount to some handicap, at least, for a child to be declared a bastard. Were this to happen, what is more, the child would be left with no identifiable father.[70] When considering the approach of Didcott J., one should compare it with the earlier reasoning of Ormrod J. in In Re L[71] where the learned judge argued that today the attitude towards illegitimacy and the legal incidents of being born a bastard have changed to a remarkable degree. He further advocated that where these social changes are accompanied by scientific developments which provide an invaluable evidential tool to help in the solution of problems such as paternity, to decline to use prevalent scientific and medical advances in deference to tradition is to run the risk of imposing a restriction on the ability of the court to do justice, which is difficult to justify.[72]

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[70] Op. cit. Note 1 supra, at 865.

[71] 1968 P 119 as quoted in Seetal v Pravitha and Another NO op cit. supra Note 1 supra, at 851.

[72] Ibid.

It would appear that his final analysis of the situation was simply that, whilst the interests of the child are extremely important, they should not be the exclusive consideration. I find myself clearly in support of this latter argument.

In the light of the foregoing, it would appear that Seetal v Pravitha and Another NO[73] has not taken the law in an appropriate direction. Unfortunately, the subsequent legislation did little to remedy and/or resolve the dilemma facing the courts. In M v R, Kotze J. attempted to rectify some of the controversy surrounding the proving of paternity. In keeping with the decision of Kotze J., the present rule of South African law, thus, appeared to be that the Supreme Court may compel (or consent in the case of a minor) any person to submit himself/herself to a blood test. Such a state of the law is to be lauded and also paves the way for the introduction of the DNA profile test as a means of resolving paternity disputes.[74] As described earlier, the benefit of this technique will always be more expeditiously realised if all the parties to the dispute provide blood samples.[75]

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[73] Op. cit. Note 1 supra.

[74] Ex Parte Emmerson 1992 (3) SA 987 (W) has taken the law even further. See pp.78-9 supra.

[75] See Chapter 3 supra, at p.70 et sec.

However, following M v R came Nell v Nell[76] and S v L[77] which effectively took the law all the way back to E v E and Another.[78] The state of the law in South Africa, with specific regard to the status of forensic tests in paternity disputes, is uncertain and unsatisfactory.

In light of the great scientific advances, the researcher recommends the early establishment of a laboratory capable of performing DNA profiling on a commercial basis. Compulsory testing, with its concomitant repercussions, can only be justified and supported if one is assured that the results of the test will yield an answer which is certain. This must be followed by the subsequent enactment of appropriate legislation which will strike the right balance between being too restrictive, on the one hand, and too generous, on the other. A definite effort should be made to give effect to the findings of the Law Commissioners who worked on Project 38 and the findings of Kotze J. in M v R, bearing in mind the recent judgment ordering DNA profiling, handed down by Schutz J. in Ex Parte Emmerson.[79] The best way forward for the South African law is, clearly, for Parliament to enact legislation setting out the rules governing the status of forensic tests in civil, especially paternity, disputes for, as McQuoid-Mason writes, the

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[76] Op. cit. Note 3 supra.

[77] Op. cit. Note 4 supra.

[78] Op. cit. Note 7 supra.

[79] Op. cit. Note 72 supra.

compulsory extraction of blood is an interference with the 'bodily integrity' of those concerned, to which our Courts are unlikely to lend themselves 'unless specifically authorised to do so by Parliament'.[80]

[80] McQuoid-Mason D.J. op. cit. Note 60, at 164.

CHAPTER SEVEN

THE ADMISSION OF DNA PROFILES AS EVIDENCE IN DISPUTED PATERNITY CASES

7.1 PROPOSED STANDARDS TO ENSURE THAT DNA PROFILING MEETS COURT REQUIREMENTS

Certain procedural safeguards must be followed to ensure the reliability of the DNA profiles. Implementation of these safeguards and standards would mean that all current and future laboratories would operate under proven standards. This should help to assuage judicial concerns about the reliability of the tests. The following are some of the reccomendations that would enhance the probative value of the DNA profile procedures:

7.1.1 A Stable Probe

The first very important safeguard that must be applied is the validation of any probe used, as a stable genetic marker. A stable probe ensures that the results of DNA typing are constant and can be independently verified. Such a genetic marker will produce bands at the same location throughout an individual's lifetime, and a portion of those bands will be passed to any and all of his offspring, write

Baird et al.[1] Extensive pedigree studies have confirmed the stability of the present DNA probes as well as their inheritance from generation to generation.

7.1.2 Sufficient Population Data Must be Obtained and Research Conducted[2]

7.1.3 All Laboratories Should Have Written Laboratory Protocols Setting Out the Procedures to be Followed When Obtaining a DNA Profile

A further practice that may be implemented to ensure rapid acceptance of the test results would be for all laboratories to have written laboratory protocols. In other words, every laboratory offering DNA typing should follow written guidelines - or protocols - which lay out the procedures for the training of personnel, equipping the laboratories, and reviewing of the test's results.

The guidelines must set out the entire process to be followed from the time the sample is received, they must outline the testing procedures, and the review of results,

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[1] Baird M., Giusti A., Shaler R. et al. 'The Application of DNA-Fingerprints for Identification From Forensic Biological Materials' 1988 2 JOURNAL OF FORENSIC HAEMOGENETICS 396, at 396; Gill P., Jeffreys A.J. and Werrett D.J. 'Forensic Application of DNA "Fingerprints" ' 1985 318 NATURE 577, at 577.

[2] For a full discussion, see infra at p.73.

including all administrative and recording procedures. To enhance the veracity of the results, the test results must be interpreted by a technician who was not involved in the test and who is unaware of the sources of the samples. All results should then be reviewed by the senior scientist or laboratory supervisor. The technician and the superior must independently agree on the presence of a band. The protocols should also establish minimum qualifications and training requirements for technicians who perform the tests and for supervisors who review them.

As an additional requirement when the results of DNA profiling are used in civil proceedings, the guidelines should provide for the defendant to have access to independent review and retesting of the DNA analysis. Independent retesting of samples is not a problem in paternity, for the sample size is not restricted. However, until the accuracy and error rate of the test are clearly established, the laboratories themselves should ensure duplicate testing of samples whenever possible.

7.1.4 Adoption of One Standardised System of DNA Profiling Analysis

The ultimate goal of the laboratories and personnel involved in testing procedures should be the eventual adoption of one standardised system of DNA analysis. A standardised system has a number of virtues. First,

uniform use of one or several probes will help generate larger population statistics more quickly because now the samples from different laboratories may be aggregated into a common population data bank for determining population frequencies. Sensabaugh believes that standardisable aspects must include the isolation and denaturing techniques and the gels used.[3] Additionally, he advocates that a uniform nomenclature should be promulgated for consistent and unambiguous analysis and recording of DNA samples. Consequently, uniform procedures will be easier to regulate and to criticise if they deviate from accepted procedures. Independent testing of the same sample by different laboratories would be facilitated, since they would all use the same probes and procedures.

However, while the benefits of a standardised system are strong, there are rationales for proceeding slowly. One of the paramount concerns should be that the system chosen might not be the best system. Yet, acceptance of that system as the standard system could give it a status that might crush the development of rival and possibly superior techniques; and even if alternate systems did emerge, their adoption might still be slowed by the weight of the current standard system.

It is quite possible that no single system will emerge as

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[3] 'Forensic Biology - Is Recombinant DNA Technology in its Future?' 1986 31 JOURNAL OF FORENSIC SCIENCES 393, at 394.

the clear choice, but rather, that a combination of tests, depending on the size, type, and condition of the sample, will be employed.

As scientific evidence, the results of DNA profiling performed by a scientist, derive their trustworthiness from the earlier research experiments validating the hypothesis that the test accurately analyses and can reproduce a person's DNA profile. Those experiments, however, afford no assurance of the trustworthiness of the forensic test offered at trial unless the forensic scientist absolutely replicated the conditions in effect during the earlier experiments. Therefore, it would appear that a sine qua non for acceptance is duplicating all the controlled variables in the earlier experiments. That this requirement has not been practised has proven to be the consistent basis for any rejection of DNA evidence.[4] As Taitz poimts out, DNA evidence, if it has been rejected has been declared inadmissable because of failures caused largely by inadequate methodology.[5] McLeod comprehensively sums up the need for proper laboratory protocols as follows:

> ... Tran's case, following on from Castro, makes it clear that DNA evidence cannot always be safely relied upon. The disagreement among experts ... as to appropriate procedures and

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[4] See N15 supra.

[5] Taitz J.L. 'DNA-Fingerprinting as a Forensic Identity Test - A Reappraisal' 1992 109 SOUTH AFRICAN LAW JOURNAL 270, at 281.

> safeguards highlights the need for agreed scientific standards with regard to DNA profiling.[6]

However, in the earlier stages, the lack of a standardised system should not affect the admissibility of any particular system as long as the test is reliable and the laboratory offering the test uses sound testing procedures.

7.2 POSSIBLE GUIDELINES FOR A COURT DELIBERATING THE ACCEPTABILITY OF DNA PROFILE EVIDENCE

It is my opinion that, at the present time, to advocate that the courts take judicial notice of the results of DNA profiling may be somewhat premature. Errors caused by using inadequate test procedures have been known to occur.

DNA profiling, it must be emphasized, is a potent tool for determining the identity of an individual from biological evidence and appears to be scientifically reliable.

Thus, courts should admit evidence derived from such novel scientific techniques only when the techniques have gained general acceptance in the relevant scientific community.

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[6] McLeod N. 'English DNA Evidence Held Inadmissable' 1991 CRIMINAL LAW REVIEW 583, at 589. See also N15 supra.
In the U.S.A., to avoid this very problem, only specific laboratories have been given the necessary accreditation to perform DNA profiling on a commercial basis. This ensures that standards are set and maintained and only laboratories that have been inspected and found to meet these standards are permitted to perform the tests.

Alternatively, some commentators have proposed that independent panels of experts assess novel scientific evidence before it is admitted in a court. Requiring the prior acceptance of scientific techniques by scientists will help to ensure that the techniques are reliable for, after all, scientists are those persons most qualified to assess scientific reliability. Effectively, a panel of technical jurors passes judgement on the probative value of the evidence before it is presented to a lay officer presiding who might be unduly swayed by the perceived infallibility of science.

When evaluating highly technical procedures such as DNA profiling, the courts will obviously require a high degree of acceptability by scientists. Lawyers clearly lack the necessary technical expertise and thus cannot independently evaluate reliability. Instead, they must depend upon expert testimony and, thus, are concerned that the basis for the expert testimony is well accepted by scientists as reliable. It is obvious, therefore, that with DNA profiling the courts will need a broad level of scientific acceptance of the tests. In addition to, or in the alternative, the courts may adopt the approach whereby a witness qualified as an expert by knowledge, skill, experience, training or education, may testify to the probative value of the evidence.

In addition, each DNA profile introduced must be

administered properly. Proper application of a particular test requires equipment that is in good condition, adherence to proper procedures, and qualified persons performing the test and interpreting the results. According to Dr Ian Wiid, the minimum personnel requirement in any laboratory performing DNA profiling, would be one graduate with a doctorate in medical biochemistry and one technician, also with a degree in medical biochemistry.[7] The difference between a reliable test and proper application of the test is that a reliable test requires standardized procedures which produce replicable results, whilst proper testing on the particular occasion requires adherence to those standardized procedures.

In any case, challenges to proper administration go to the weight given to the evidence, not to the admissibility of the evidence. Note, however, that this still means, though, that even after a court accepts this novel scientific test as reliable, the evidence derived from it must still meet the standards applied to determining the admissibility of any other evidence.

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[7] Annexure to the letter from Dr L. Böhm, dated 26 May 1992. Dr Wiid is the Head of the Department of Medical Biochemistry at Tygerberg Hospital.

7.2.1 Are DNA Profiles Reliable in Forensic Situations?[8]

Since scientists generally agree that it is theoretically possible to identify individuals from their unique DNA patterns, the pertinent enquiry becomes whether the DNA profiles employ this theory reliably in forensic situations. This is a very necessary consideration which must be looked into in any discourse on whether or not there should be judicial acceptance of DNA profile results in the courtroom.

In evaluating the reliability of novel scientific techniques, courts generally look to three sources: expert testimony from the relevant scientific community, scientific and legal writings, and judicial opinions. These may all be sought from local or foreign jurisdictions.[9]

However, Weinstein and Berger advocate that in establishing reliability there is a more detailed examination to be carried out.[10] Inter alia, they maintain that the courts must note the level of acceptance in the scientific

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[8] See also Chapter Four.

[9] Gianelli P. 'The Admissability of Novel Scientific Evidence: Frye v United States, a Half-Century Later' 1980 80 COLUMBIA LAW REVIEW 1197, at 1215-9.

[10] Weinstein J. and Berger M. WEINSTEIN'S EVIDENCE (and SUPPLEMENT) (London 1987 (and 1988): Oxford University Press) 702-18 (and 702-19).

community, the testifying expert's qualifications, existence of specialised literature dealing with the technique, the use that has been made of the technique, expert testimony in previous cases, the novelty of the technique, frequency and type of error, and the existence of testing standards.

7.2.2 Expert Testimony

The procedure of obtaining DNA profiles is so technical that courts cannot independently assess their reliability. Instead, they must depend on testifying experts. Courts will probably not evaluate the content of the expert testimony on DNA but instead will require that the testifying experts be highly qualified.[11] Internationally, to date, the experts who have testified in DNA cases have been well-qualified molecular biologists who are experienced in the use and analysis of DNA. In general, however, two types of experts are likely to testify as to the reliability of DNA profiles and the profiling techniques: molecular biologists from the laboratories that perform the DNA profiles, and molecular biologists from the academic community.[12]

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[11] See Menday v Protea Assurance Co. Ltd 1976 (1) SA 565(E), at 579 and Mahomed v Shaik 1978 (4) SA 523(N).

[12] In the case of S v Andrews, No. 87-1400 (Ninth Judicial Circuit Court, Orange County, Florida, Division 15, Oct 20, 1987), DNA tests were admitted and the qualifications of the testifying experts were as follows: David Houseman, Ph.D. (Biology), professor of biology at M.I.T. since 1975, head of molecular

Molecular biologists from the laboratories who testify, typically senior scientists, are familiar with the laboratory facilities, the testing standards, and the type of DNA profile required from the sample. These experts perform or supervise numerous tests and have valuable experience with forensic samples gathered under field conditions. Nevertheless, the conclusion could be reached that the testimony of these laboratory experts is tainted; for often the experts have intimate connections with the laboratories and financial interests in the DNA profile techniques, and often their reputations and careers are built on the success of the tests and the admissibility of the test results. Consequently, their testimony is susceptible to the charge of bias. Thus, as a back-up to ensure the reliability of the DNA profiling procedures, the courts could look to the academic community to assess the tests impartially.

Molecular biologists from the academic community may even be preferable as reliability experts because they do not have financial interests in DNA typing. They are

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genetics laboratory at M.I.T., published 120 papers on DNA, member of genetic disease foundations; Michael Baird, Ph.D. (Genetics), published 35 papers on DNA, manager of forensic testing at Lifecodes. Similarly, in the case of R v Davies (Crown Court at Mold, Nov. 24-27, 1987), the DNA test results were admitted. Testifying experts were Alec Jeffreys, Ph.D., professor of genetics at the University of Leicester, developer of the DNA fingerprint; Peter Gill, Ph.D. (Genetics), forensic scientist from the Home Office Central Research Establishment; David Werrett, Ph.D. (Biology), forensic scientist from the Home Office Central Research Establishment.

knowledgeable about laboratory procedures and use similar tests in their research. Thus, they have the necessary background to evaluate whether DNA profiles identify individuals reliably and whether the procedures employed by the laboratory are generally acceptable as sufficient by the greater scientific community. However, one drawback of academic molecular biologists is that they may lack first-hand experience as to the reliability of the particular type of forensic DNA profile being offered as evidence, and they may be unfamiliar with the capabilities and procedures of the specific laboratory involved. These deficiencies could, however, be easily remedied if they had familiarized themselves with the laboratory facilities, the testing standards, and the type of DNA profile used there.

Ideally, though, both types of experts should testify as to the reliability of current DNA profiles. Such combined testimony would maximise the courts' knowledge of the reliability of forensic DNA profiling and its procedures and minimise the adverse effects of biased testimony. The combined testimony would thus ensure that the testimony of 'interested' experts could be corroborated. The bigger pool of experts might also demonstrate more convincingly to courts that DNA profiles have been generally accepted by a larger scientific population than the handful of molecular biologists who perform forensic DNA profiles. A broader base of experts would also ensure that the defence would have access to experts to rebut the testimony of the

prosecution's experts.

Courts may possibly not allow molecular biologists to testify about statistical frequencies which might be outside the scope of their expertise. The solution, then, would be to bring in a genetics statistician to testify regarding genetic marker frequencies. However, molecular biologists have had some formal training in statistics which should be sufficient to allow them to explain the statistics used in a particular DNA profile.

7.2.3 Scientific and Legal Writings

Scientific and legal writings may augment expert testimony to show the level of acceptance; but basing the courts' decisions only or largely on a review of scientific literature to determine whether a novel scientific technique is accepted within the scientific community can be dangerous. The primary reason for this assertion is that the courts may not understand the highly technical information or may not discover all the relevant articles. Gianelli believes that the courts should instead rely on the oral testimony of experts.[13]

Most literature on the forensic use of DNA profiles, however, is generated by commercial laboratories and other proponents of forensic DNA profiling. The literature,

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[13] Op.cit. Note 9 supra, at 1217.

thus, is susceptible to the same charges of bias as is the testimony of experts from the commercial laboratories. As a result, the courts may attach more importance to the published articles of academics, whose livelihoods do not depend on the success of the DNA profile procedures.

Nevertheless, the laboratory-generated literature remains relevant because its authors discuss problems, techniques and testing methods that are unique to the forensic use of DNA profiles. Second, forensic journals offer the best opportunity for peer review and criticism of the various DNA profiles.

7.2.4 Judicial Opinions

Internationally, DNA profiles have been admitted in numerous criminal and civil cases.[14] To quote Professor Imwinkelried, 'For the most part, courts have been receptive to DNA evidence. The overwhelming majority of courts that have passed on DNA typing have held the evidence admissable.'[15]

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[14] Singh D., 'A Means of Certain Identification in the Criminal Law' 1992 15 COMPARATIVE AND INTERNATIONAL LAW JOURNAL OF SOUTH AFRICA 90-94. In In Re J (1987) F.D., Sheldon J. was content to accept the proofs from a DNA fingerprint test into evidence in a case dealing with the wardship of a six month old infant.

[15] Imwinkelried E.J. 'The Debate in the DNA Cases over the Foundation for the Admission of Scientific Evidence: The Importance of Human Error as a Cause of Forensic Misanalysis' 1991 69 WASHINGTON LAW QUARTERLY 19, at 20.

However, the acceptance of DNA evidence has by no means been unanimous. One of the eaerliest reported cases of the rejection of DNA profile evidence, in the United States, was People v Castro (545 N.Y.S. 2d 985 (Sup Ct 1989)). This was followed shortly by State v Schwartz (447 N.Y. 2d 422 (Minn. 1989)).

From the case reports, it appears that both courts conceded that DNA profiling, per se, was a generally acceptable technique for identity. However, in both cases counsel for the defence was able to successfully attack **the manner** in which the prosecution experts had applied DNA profiling. (In S v Schwartz, 428, the court held, 'While we agree with the trial court that forensic DNA typing has gained general acceptance in the scientific community, we hold that the admissability of specific test results in a particular case hinges on the laboratory's compliance with appropriate standards and controls... .')

Consequently, in both the aforementioned cases, the courts only excluded the evidence provided by DNA typing for the reason that the prosecution did not establish that the analysts had followed proper scientific procedures on the specific occasion that they conducted the DNA profile in question. (See Imwinkelried supra, at 21. In People v Castro, at 997, the Court, per Sheindlin J., held that, '... the credible testimony ... clearly established that the testing laboratory failed to conduct the necessary and scientifically accepted tests ... .'

The Minnesota Supreme Court correctly observed in State v Schwartz, at 426, that, '...specific DNA test results are only as reliable and accurate as the testing procedures used by the particular laboratory.'

In New South Wales, the court, in the case of R v Tran (unreported), again refused to be persuaded by the DNA evidence presented to them. (See McLeod N. op. cit Note 6, at 589.) Again the reason for this rejection was not that the court denied the value of DNA typing but based on the apparent disagreement among experts from Cellmark Laboratory, which conducts DNA typing on a commercial basis, and those appearing for the defence, as to the appropriate procedures and safeguards, the court was left unconvinced that the proper testing procedures had been conducted. That this requirement has not been fulfilled appears to be the consistant basis of all subsequent rejections of DNA evidence.

It must be emphasised, however, at this point, that at no stage have the courts questioned the actual

7.3 CONCLUSION

To date, DNA profiling has made the transition from unproven theory to accepted scientific procedure and practice. The ready acceptance of the theory underlying DNA profiling in the scientific community, and the fact that reliable techniques exist, have greatly enhanced the probative value of this test. In this sense these two doors have been closed and need not be reopened. Now, practitioners must place their emphasis on whether testing laboratories have followed the accepted procedure in each case. Adoption of the safeguards proposed above will surely enhance the reliability and statistical soundness of the DNA profile tests.

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scientific value and basis of DNA profiling as a tool for identification.

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