

DNA: CRIME, LAW AND PUBLIC POLICY

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Abstract

In some ways the use of DNA evidence has revolutionised criminal proceedings, in others, it has contributed confusion and challenges for the law. There is little dispute that whatever its value in criminal fact-finding, DNA does have evidentiary limitations. DNA evidence is not infallible and issues regarding its admissibility are commonplace. These issues include the legality of the sample, the reliability of the DNA analysis, the interpretation of the results and whether the jury is capable of comprehending the results. In trying to grapple with these problems courts are gradually developing guidelines for the admissibility of DNA evidence. This paper seeks to review the grounds by which DNA evidence has been admitted and challenged, examine the approaches of our courts to the key issues, and focus on the future challenges DNA poses for the law.

INTRODUCTION

In the 1980s, the genetic revolution gave rise to the introduction of DNA evidence into the courtroom. Since its inception, DNA evidence has been found to be generally admissible as well as extremely reliable by courts. More importantly, it has been crucial in many cases for determining the innocence or guilt of an accused. The recent Queensland cases of *R v White*¹ and *R v Button*² epitomise the impact that DNA evidence has achieved in criminal trials; *R v White* involved a case where the accused had first been charged with the murder of a woman in 1990. However, at the time the Crown had little evidence and the DNA technology was inadequate to provide a significant match between the sample of the offender taken from the victim and that of the accused. Consequently, the accused did not have to stand trial. However, by 1996 the DNA profiling technology and statistical analyses had substantially improved. Specimens from the accused were subsequently retested, ultimately leading to White's conviction of

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¹ *R v White* (unreported), QLD Supreme Court (4 November 1998).

² *R v Button* (unreported) [2001] QCA 133 (10 April 2001).

³ *R v White* (unreported), QLD Supreme Court (4 November 1998); Cranny, G. 'The Expanding Use of DNA Analysis in Criminal Investigations' (1999) 1 *Proctor*, 16.

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murder in 1998.³ In contrast, in *R v Button* it was revealed that an innocent man had been convicted of rape and had served 10 months in jail for the crime.⁴ At the insistence of his lawyers DNA testing was performed and established that he could not have been the perpetrator. Upon appeal, the conviction was quashed on the basis of the new DNA evidence. Although declared by Williams J as a black day in the history of the administration of criminal justice in Queensland, the impact that DNA evidence had on this case cannot be disputed.

The above cases highlight how the introduction of DNA testing has revolutionised criminal investigations. Nevertheless, the use of DNA evidence does have limitations. Courts are now increasingly aware that DNA evidence may not be infallible and that there may indeed be potential for error. As a result, in many later cases, DNA evidence was held to be inadmissible.⁵ Interestingly, the ways in which the admissibility of DNA evidence has been brought into question is not just limited to the technology, but has extended to the actual taking of the specimen and to the final interpretation of the results. In addition, issues have arisen as a result of conflicting expert opinions, as well as the inability of juries and the judiciary to understand the scientific complexities of such evidence.

THE SAMPLE

One of the first major hurdles for the admissibility of DNA evidence is ensuring that the samples, upon which the DNA analyses have been performed, have been legally acquired. Further, in certain circumstances where samples have been collected from a crime scene, corroborating evidence will be required to show that the DNA sample was in fact from the perpetrator.

The Legality of the Sample

Whether a sample has been legally obtained will normally depend on compliance with the relevant state or territory legislation. In *R v Braedon*⁶, the Northern Territory Supreme Court was asked to consider the legality of a buccal swab taken from a defendant in a sexual assault case. The accused was among a number of men who were seen in the general area at the time the assault occurred. After consenting to a swab specimen to help police with their investigations, a match was made

⁴ *R v Button* (unreported) [2001] QCA 133 (10 April 2001).

⁵ For example: *R v Braedon* (unreported) [2000] NTSC 68 (31 August 2000); *R v Miroslav Juric* (2002) 4 VR 411.

⁶ *R v Braedon* (unreported) [2000] NTSC 68 (31 August 2000).

between the accused's DNA and DNA evidence taken from the crime scene. A blood specimen was also later taken from the accused under s145(3) *Police Administration Act 1978* (NT), which enables a specimen to be obtained from a person if there are reasonable grounds for believing that an analysis may provide evidence relating to the offence, and (a) the person has given his consent in writing; or (b) a Magistrate has authorised the taking of the specimen. The issue at trial was whether the accused had truly consented to the taking of each specimen and whether the accused had full knowledge of what was occurring. In deciding the case there was a great deal of focus on the fact that the accused could not read. The accused consented to the taking of each specimen by signing consent forms. However, there was doubt as to whether the police satisfactorily explained the contents of either consent form to the accused.

In relation to the buccal swab the police stated that they used standard procedure to explain the purpose of taking the swab. In contrast, the accused submitted he was told to provide a specimen.⁷ Interestingly, an audio recording was made when taking the blood specimen and on the recording an explanation of the contents of the consent could be heard. However, Martin CJ criticised the manner in which the form was explained, suggesting that it may have left the accused perplexed. Martin CJ noted: 'He did not raise ... any question of his right to decline to have the sample taken'.⁸ Therefore, it was found that the accused had not consented to the taking of either sample.

The prosecution further argued that the police might have simply obtained an authorisation from a magistrate. However, Martin CJ stated that this procedure was not undertaken and so would not speculate as to whether a magistrate would or would not have given the authority. As a result, the DNA evidence from these specimens was held to be inadmissible.

Under some circumstances, non-compliance will not necessarily rule the evidence inadmissible. In *R v Daley*⁹ the NSW Supreme Court was asked to determine the admissibility of DNA evidence submitted by the Crown in a sexual assault case. In this case the police had arrested a suspect of a series of sexual assaults on the basis of a minor traffic offence and had used the arrest to conduct a breath test. From the breath test the police were able to obtain DNA evidence, which they were then able to match with DNA taken from one of the victims of the sexual assaults. The accused argued that the DNA evidence was

⁷ *R v Braedon* (unreported) [2000] NTSC 68 at [5] (31 August 2000).

⁸ *R v Braedon* (unreported) [2000] NTSC 68 at [29] (31 August 2000).

⁹ *R v Daley* (unreported) [2001] NSWSC 1211 (14 September 2001).

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obtained under false pretences and that it resulted from the improper exercise of the power to arrest. Therefore, it was contended that the evidence should be excluded because it was *improperly or illegally obtained* under s138 of the *Evidence Act 1995* (NSW).¹⁰

Interestingly, it was recognised by the Court that the true purpose of making this particular arrest was to obtain a sample of the accused's DNA. This fact was not denied by either of the police responsible. Simpson J noted that such a situation would ordinarily amount to an abuse of power and would be a significant impropriety. However, in this particular case there were two major factors which made him conclude otherwise. Firstly, the accused was, in fact, guilty of the motor vehicle offence and therefore the arrest was lawful. Secondly, there was reasonable evidence to suggest that the accused *had been* responsible for the sexual attacks and that a sense of urgency existed to find the perpetrator as more attacks were expected.¹¹ The DNA evidence was subsequently held to be admissible.

SOURCE OF THE DNA

One of the problems associated with the use of DNA evidence is that it cannot always be determined when the DNA was actually left by the perpetrator. Unlike fingerprints, which only last at a crime scene a short time, DNA is quite robust and can last days, weeks or even years under the right conditions. Therefore, it is possible that DNA can be left by a person at a crime scene, even though they were not present at the time the crime was committed. Such was the argument used by counsel for the accused in *R v Stokes*.¹² In this case the court was asked to consider the admissibility of DNA evidence that the Crown wished to lead against the accused in a murder trial. The DNA evidence showed that the accused could not be excluded as the contributor to DNA profiles found on the deceased's jeans. However, the Crown could only *infer* that the DNA was placed on the deceased by the accused. In considering the admissibility of the evidence Mildren J found that there was little or no evidence to support the Crown's inference. As a result, his Honour believed there was an unacceptable danger that the evidence may be improperly used by the jury because it could not be sufficiently determined when the DNA was placed on the deceased: 'The sample may have been left even some days earlier. It is not known when the jeans were last washed, and whether washing would have removed any

¹⁰ *R v Daley* (unreported) [2001] NSWSC 1211 at [105]-[109] (14 September 2001).

¹¹ *R v Daley* (unreported) [2001] NSWSC 1211 at [114] (14 September 2001).

¹² *R v Stokes* (unreported) [2000] NTSC 12 (16 March 2000).

¹³ *R v Stokes* (unreported) [2000] NTSC 12 at [14] (16 March 2000).

traces of such samples'.¹³ The DNA evidence was subsequently found to be inadmissible on the basis that it was weak and demonstrated little probative value.

THE DNA ANALYSIS

In recent years there have been a number of grounds by which DNA testing methodologies have been contested in court. The arguments have mainly focused on whether the methodology was accepted as reliable by the scientific community or if the database used within the analysis was adequate. There has also been some dispute over the use of partial profiles that have been derived from low quality DNA samples.

Acceptance of the Testing Methodology by the Scientific Community

Issues regarding the reliability and scientific acceptance of DNA testing methodologies do not often arise now but did in the early 1990s when scientific protocols such as Restriction Fragment Length Polymorphism (RFLP) and Polymerase Chain Reaction (PCR) were still relatively new techniques. In *R v Brown*¹⁴, DNA evidence was led by the prosecution to link the accused to the murder of a woman. During the trial, it was contended by the accused that the testing procedures were novel and had not gained general acceptance within the relevant scientific community, therefore the evidence should be excluded. Wright J noted that the technology was relatively recent, having only been developed in the mid 1980s. However, his Honour concluded that the techniques could no longer be regarded as novel or experimental systems. In coming to this decision, Wright J was persuaded by evidence showing the use of the particular DNA testing methods by the scientific community, including law enforcement bodies, throughout the world. In addition, it was shown that some of the intermediate steps used in the DNA assays had been recognised within the scientific community for many years as being reliable procedures. Subsequently, the DNA evidence, including tests done as early as 1987 and 1988, was held to be admissible. Wright J noted that a trial judge, in his discretion, could rule DNA evidence as inadmissible if it had little or no probative value. During the trial the defence counsel tried to challenge the reliability of the technology by highlighting anomalies in the process. However, Wright J stated that this would only preclude the evidence from being admissible where these anomalies could not be adequately explained to a jury. Wright J did not consider this to be a problem in this case.

An interesting twist of the scientific acceptance argument was used in *R v Maximo Pantoja*.¹⁵ In this case, a somewhat reversal of this argument

¹⁴ *R v Brown* (unreported), TAS Supreme Court (20 June 1999).

¹⁵ *R v Maximo Pantoja* (1996) 88 A Crim R 554.

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was used. Here it was claimed that RFLP was no longer 'in vogue' and had been replaced by PCR as the method of choice, therefore, the RFLP results should be excluded. In dismissing the argument Hunt CJ noted that RFLP was still being used in laboratories in the United States, the United Kingdom and in Australia and 'therefore retains general acceptance in the particular scientific field in which it belongs'.¹⁶

In an attempt to prevent arguments regarding the validation of DNA tests, most Australian forensic laboratories have now moved to using the Profiler Plus system (Applied Biosystems), which is used extensively throughout the world. However, in two recent cases defence counsels tried to attack the validity of the tests performed on the Profiler Plus system. Both of these cases involved murder trials in which the DNA evidence had been used by the Crown to link the accused with murder. In *R v Karger*¹⁷, counsel for the defence argued that the Profiler Plus system was not recognised and accepted by the relevant scientific community as reliable, therefore the DNA results should be excluded. One of the major arguments was that the Profiler Plus was utilising new primer sequences and that these had not been disclosed to the laboratories using the system, primers are synthetic pieces of DNA that are critical to the facilitation of the PCR process. During the hearing, expert testimony was used to contend that it was critical that the primer sequences be known to the users of the system, so that any problems with their use could be predicted and thus avoided. The argument was further supported by guidelines established by NATA (National Association of Testing Authorities), an Australian authority that accredits scientific institutions. However, it was noted by the court that Applied Biosystems had declined to disclose the primer sequences used in the system (to protect their intellectual property). Because Applied Biosystems would not disclose the sequences, it could only be speculated that the primers were in fact new. The argument was continued on the basis that the primer sequences were unknown by the users of the system. In his judgement, Mullighan J provided a lengthy and comprehensive analysis of the wide body of evidence submitted at the hearing. When considering the argument Mullighan J cited relevant case law from the United States and noted that it was not necessary that there be universal or unanimous acceptance of the technique in the scientific community but that it only needs to be generally acceptable and reliable.¹⁸ Mullighan J concluded that the Crown had clearly established this:

'The evidence in the present case was clear and, in my view,

¹⁶ *R v Maximo Pantoja* (1996) 88 A Crim R 554 at 560.

¹⁷ *R v Karger* (2001) 83 SASR 1.

¹⁸ *R v Karger* (2001) 83 SASR 1 at 45.

¹⁹ *R v Karger* (2001) 83 SASR 1 at 55.

overwhelming. Whilst the Profiler Plus system is relatively new, it utilizes familiar technology ... which ... is widely, almost universally, accepted in the relevant scientific community as reliable and accurate'.¹⁹

Mullighan J added that even if the primer sequences in the assay were new, they had clearly been accepted by the relevant scientific community. The DNA evidence was found to be admissible.²⁰

Months later in the NSW Supreme Court, it was also argued in *R v Gallagher*²¹ that the tests provided by the Profiler Plus were unreliable as the primer sequences used in the system were not known. During the proceedings, the Crown expert showed how the Profiler Plus system had been extensively validated overseas, including by Applied Biosystems, who manufacture it. In his judgement, Barr J made reference to Mullighan J in *R v Karger* stating: 'His Honour's conclusion, whilst not binding on me, is one to which respect should be accorded in view of the detail of evidence taken over a long enquiry and of his Honour's careful judgment'.²² Further, when considering the NATA requirements Barr J noted that they had been derived from TWGDAM²³ in the United States and that TWGDAM had recently removed the requirement that primer sequences be known.²⁴ Barr J also noted that there was no attack made on any of the individual DNA results submitted by the Crown, by reference to other evidence in the case. The DNA evidence was subsequently found to be admissible.

The DNA Database

Human biobanks are the subject of analysis in Australia, England, Canada and Scandinavia²⁵ in both the medical or criminal spheres. The main issues regarding these databases and subsequent statistical analyses have been the size of the database, whether it was a representative sample of the population and whether it took into account the ethnicity or race of the offender.²⁶ The argument in many cases has been that failure to consider these factors could lead to the statistical evidence being greatly skewed against the accused. For instance, in *R v Maximo Pantoja*²⁷,

²⁰ *R v Karger* (2001) 83 SASR 1 at 55.

²¹ *R v Gallagher* (unreported) [2001] NSWSC 462 (4 May 2001).

²² *R v Gallagher* (unreported) [2001] NSWSC 462 at [87] (4 May 2001).

²³ Technical Working Group on DNA Analysis Methods was a scientific body in the US which published validation criteria for systems for DNA analysis. It was replaced in May 2000 by the DNA Advisory Board (DAB).

²⁴ *R v Gallagher* (unreported) [2001] NSWSC 462 at [89] (4 May 2001).

²⁵ See: Hansson, M. (ed) *The Use of Human Biobanks - Ethical, Social, Economical and Legal Aspects* (Report 1 from the Research Project The Use of Human Biobanks - Ethical, Social, Economical and Legal Aspects, Uppsala University, 2001).

²⁶ Roberts, H. 'Interpretation of DNA Evidence in Courts of Law - A Survey of the Issues' (1998) 30 *Australian Journal of Forensic Sciences*, 29.

²⁷ *R v Maximo Pantoja* (1996) 88 A Crim R 554.

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both the size of the DNA database and whether it took into account the race of the accused were at issue. In determining that the DNA evidence was inadmissible Hunt CJ noted:

‘Without any greater knowledge as to the validity of the size of these databases, that evidence would have overawed the jury by the seemingly scientific garb in which it was presented, with the very real risk that they would have thought that it had greater weight than it may have been capable of bearing’.²⁸

It is interesting to note in this case that although the DNA evidence was held inadmissible on the *size* of the database, the argument regarding the ethnicity of the accused was rejected by the court. This was despite the fact the appellant was one of very few South American Indians living in the Sydney area. Although the court recognised that ethnicity was important when considering the probability of a DNA match, they held that it was not the *accused’s* ethnicity or race that was to be considered. Rather, it was the ethnicity or race of the *offender*. In this case the ethnicity of the offender could not be established. The court held that in these situations it was acceptable to use a DNA database representative of the general population.

Courts are now less likely to hold DNA evidence inadmissible on the basis of the representativeness of a DNA database or ethnicity. One of the main reasons for this is that continued research has failed to find significant differences in the common genetic markers between populations throughout the world, including different ethnic groups.²⁹ Subsequently, courts now tend to let the jury decide the weight to be put to the evidence. In *R v Humphrey* Bleby J stated:

‘If a data base has been used which, for some reason, is not shown to be representative of the population from which the unknown sample may have come, or if it appears that the data base is not representative of the racial group from which the known sample comes and that the DNA profiles of that racial group do or may bear different characteristics from those revealed in the population represented in the data base, then that will no doubt be exploited before the jury. The jury will be able to give the evidence such weight as it deserves in the light of any criticisms that are advanced, taking into account any suggested weaknesses on which the opinion is based’.³⁰

More recently, in *R v To*³¹ an appeal against a sexual assault conviction was mounted on the basis that the DNA evidence was inadmissible as it did not take into account the race of the appellant. Barr J concluded:

‘To say that the offender’s race dictates the validity of the database is one

²⁸ *R v Maximo Pantoja* (1996) 88 A Crim R 554 at 561-562.

²⁹ Roberts, H. ‘Interpretation of DNA Evidence in Courts of Law – A Survey of the Issues’ (1998) 30 *Australian Journal of Forensic Sciences*, 29 at 34.

³⁰ *R v Humphrey* (1999) 72 SASR 558 at 562.

³¹ *R v To* (2002) 131 A Crim R 264.

³² *R v To* (2002) 131 A Crim R 264 at 272.

thing. It is quite another to say that reliable evidence can never be produced by the use of a database which cannot precisely be described as of or including the offender's race.³²

The appeal was dismissed. Subsequently, to date the only remaining significant hurdle regarding a DNA database is the validity of its size. However, this too has been somewhat resolved by the admission of confidence limits with statistical probabilities.³³

The Partial Profile

Although DNA is quite robust and can survive for considerable lengths of time, it will eventually degrade. However, degradation of the DNA does not necessarily mean that a result cannot be obtained by DNA testing. When DNA begins to degrade it gradually breaks up from larger fragments into small pieces of DNA. Depending on how far the DNA has degraded, DNA analysis may still be able to be performed on the remaining stretches of DNA. The DNA may not be able to give a complete or 'full' profile, but rather may only provide a 'partial' profile.³⁴ Nevertheless, the fact that DNA evidence may only be a partial profile may not necessarily preclude its use in court. On the other hand, its weight will be dependent on the circumstances. For instance, one of the grounds for the appeal against a murder conviction in *R v Frawley*³⁵ was that there was fresh DNA evidence that may be beneficial to the appellant. However, in this particular case the DNA evidence was found to be of poor quality and could not give conclusive results. In addition, it could not be determined that the DNA evidence actually came from the perpetrator. Therefore, in these circumstances the DNA analysis was found to be too weak for the ground to succeed.³⁶ In contrast, in *Gibson v R*³⁷ the court had no hesitation in upholding statistical evidence that was based on a partial profile. This case involved an appeal against convictions of rape and sexual assault. During the trial, a DNA expert had given an opinion that the profile obtained from the DNA would only be present one in one hundred million persons within the population. The expert conceded, however, that the DNA profile was partial as a result of insufficiency of DNA. On appeal it was argued that the trial judge should have instructed the jury that the statistic arrived at had no legal precedent in Australia. This argument was rejected on the basis that there was no evidence to that effect. The appeal was dismissed. Therefore, although potentially still admissible,

³³ Roberts, H. 'Interpretation of DNA Evidence in Courts of Law - A Survey of the Issues' (1998) 30 *Australian Journal of Forensic Sciences*, 29 at 32-33.

³⁴ Turbett, G. 'In Defence of DNA: A Scientist's Perspective' (2001) 26 *AltLJ*, 177.

³⁵ *R v Frawley* (unreported) [2000] NSWCCA 340 (30 August 2000).

³⁶ *R v Frawley* (unreported) [2000] NSWCCA 340 at [57] (30 August 2000).

³⁷ *Gibson v R* (2001) 120 A Crim R 543.

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the weight that a partial profile carries in court will be dependent on two factors; the circumstances of the case and just how partial the DNA profile is.

THE EXPERT WITNESS

Issues in court have also arisen regarding DNA expert witnesses. Arguments that have been submitted by counsel include whether the expert was suitably qualified to give an expert opinion and whether the expert actually performed the analyses themselves.

Expert Is Suitably Qualified

In the early 1990s there were number a cases that looked at whether a DNA expert was suitably qualified to provide statistical evidence. As a result of cases such as *R v Noll*³⁸ the law on this issue appears to be more settled. In *R v Noll* a biochemist had been called to give DNA evidence. In this case it was not disputed whether the expert was qualified to give testimony regarding the performance of the DNA analysis but whether he was suitably qualified to express a statistical conclusion from DNA evidence. It was noted by Callaway JA that the expert was a biochemist and had no formal qualifications in statistics.³⁹ Further, it was evident during the trial that the expert was unable to explain the statistical theory underpinning his evidence.⁴⁰ However, this was not found to be detrimental to the admissibility of the evidence. In dismissing the appeal on this ground Ormiston JA stated: 'experts can speak of many matters with authority if their training and experience entitle them to do so, notwithstanding that they cannot describe in detail the basis of knowledge in related areas.'⁴¹

In addition to the expert being suitably qualified, it should be noted that the laboratories themselves must be suitably accredited. In recent years this issue has not arisen as almost all forensic laboratories in Australia are now accredited by the National Association of Testing Authorities (NATA).⁴²

The Expert Who Performed The Test

In recent cases, there have been situations where proof of continuity of samples have found to be deficient. One of the problems that has arisen is that often the experts that present the DNA evidence in court are the laboratory heads, who have not actually completed the testing themselves, rather, they have presented the results performed by

³⁸ *R v Noll* [1999] 3 VR 704.

³⁹ *R v Noll* [1999] 3 VR 704 at 708.

⁴⁰ *R v Noll* [1999] 3 VR 704 at 710.

⁴¹ *R v Noll* [1999] 3 VR 704 at 705.

⁴² Australian Law Reform Commission, *Protection of Human Genetic Information* (Discussion Paper no 66, 2002) 857-858.

technicians within their laboratory. The arguments that have been brought by defence counsels include that the evidence could not adequately be tested so as to identify any potential flaws in the DNA analysis. Further, it has been argued that the evidence submitted by the laboratory heads is simply based on hearsay reports. One of the leading cases on this is *R v Hytch*.⁴³ This case involved an appeal against a manslaughter conviction in which the deceased's body was never found. At trial, DNA evidence was led by the prosecution to show that deceased's DNA could be found on the accused's sandal. The principal complaint by defence counsel was that at least some of expert witness's evidence was hearsay as the witness had not done all of the testing herself and therefore proof of continuity could not be shown. Although the appeal was ultimately successful on another ground, the court did find that the DNA evidence was deficient. However, the evidence was not considered to be fundamentally flawed. Mackenzie J stated: 'The deficiencies in the DNA evidence in this case are concerned with proof, not cogency. The deficiencies can be avoided in a subsequent trial.'⁴⁴

More recently in *R v Sing*⁴⁵, which involved an appeal against a sexual assault, the NSW Criminal Court of Appeal was less sympathetic to evidence given by expert witnesses. At trial the prosecution was able to show a match between DNA taken from the accused and DNA taken from a high vaginal swab of the victim. However, again the expert witnesses in this case were not those that had conducted the DNA tests. On appeal it was successfully argued for the appellant that questions could not be put to the persons who actually carried out the procedures, therefore cross-examination could not be used to find any errors in the performance of the tests. Hodgson J stated:

'Counsel for the appellant at the trial said he had an expert present in court for the purpose of assisting him with questions to be put to the persons who actually carried out the procedures, and I think this Court should proceed on the basis that there were relevant questions which the appellant's counsel wished to put to these persons if they had been called.'⁴⁶

On the other hand, it was conceded that it may be appropriate for other members of the laboratory to testify if those who actually performed the tests were unavailable. There was no suggestion, however, that this was the situation in this case.⁴⁷ The conviction was quashed and a retrial was ordered.

⁴³ *R v Hytch* (2000) 114 A Crim R 573.

⁴⁴ *R v Hytch* (2000) 114 A Crim R 573 at 589.

⁴⁵ *R v Sing* (2002) 54 NSWLR 31.

⁴⁶ *R v Sing* (2002) 54 NSWLR 31 at 36.

⁴⁷ *R v Sing* (2002) 54 NSWLR 31 at 37.

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INTERPRETATION OF DNA STATISTICS AND THE PROSECUTOR'S FALLACY

As has already been demonstrated by the section on databases the statistical results, which are derived from DNA evidence, can raise contentious issues. In addition to the issues concerning statistical validity are those concerned with the application, or interpretation of the statistics. Here, the issue focuses on the interpretation of the statistics derived by the DNA evidence, rather than the validity of the statistics themselves. The problem was first highlighted by an article published in 1986, which dubbed the problem the 'prosecutor's fallacy'.⁴⁸ In this article, there were three main ways identified by which the fallacy can occur: the evidence could be incorrectly presented by the forensic scientist, the judge or counsel could inadvertently mislead or misdirect the jury or the jury itself could misconstrue the evidence. Irrespective of the way in which the fallacy occurs, the practical effect of the prosecutor's fallacy is that a much greater weight can be assigned to DNA evidence than is otherwise warranted. Further, when this does occur the incorrect interpretation will usually favour the prosecutor's case. This was well summarised in *R v Latcha*⁴⁹ in which the Court of Appeal of the Northern Territory explored the interpretation of a DNA match. In this case the court found there were two ways to construe the evidence; the proper way is to ask 'what is the probability of obtaining a matching analysis of the crime scene sample if someone else (other than the accused) left it?' The improper way is to ask 'what is the likelihood that it was the defendant's DNA found at the crime scene?' It is the latter question that forms the basis of the prosecutor's fallacy. For instance, a DNA match of one in one hundred means that the DNA profiles of ninety-nine of every hundred persons within the given population would not match that of the perpetrator. This means that if there was five thousand people in the population there could be fifty persons with a similar DNA profile to the perpetrator. This interpretation is obviously somewhat different to saying that there is a hundred to one chance that the accused is not the perpetrator, which would be the improper approach in this scenario. However, it should be noted that DNA matches in trials can involve extremely low probabilities, such as one million to one. If the improper approach were used for such probabilities then the jury would be hearing that there is

⁴⁸ Thompson, W. and Schumann, E. 'Interpretation of Statistical Evidence in Criminal Trials: The Prosecutor's Fallacy and the Defence Attorney's Fallacy' (1987) 11 *Law & Human Behaviour*, 167.

⁴⁹ *Latcha v R* (1998) 8 NTLR 122.

⁵⁰ *R v Smith* (1998) 71 SASR 543.

a one million to one chance that the accused is not the perpetrator, which would obviously be compelling evidence for a jury.

On the other hand, the prosecutor's fallacy does not have to involve such blatantly poor interpretations of the statistics. For example, in *R v Smith*⁵⁰ one of the grounds of appeal was that the trial judge had misdirected the jury on the statistical analysis of the DNA evidence. This case involved an appeal against a number of convictions, including rape. The DNA evidence, which had been successfully used at trial, had been derived from a semen sample from one of the victims and had been found not to exclude the accused. At the trial, the forensic scientist gave evidence that 99.98 per cent of the population, but not the accused, could be excluded. When directing the jury the trial judge correctly explained that the evidence may not necessarily have come from the accused. However, when summarising the trial judge stated that the evidence 'on its own without any other would lead me to infer beyond reasonable doubt that it was the accused'.⁵¹ On appeal the trial judge's direction was criticised as being an invitation for the jury to consider the DNA evidence on its own. Perry J held that the DNA evidence must be considered together with any other relevant evidence.⁵² It was noted that 99.98 per cent was a high percentage, however, Perry J found 'it is doubtful whether it is so strong as to be capable of proving identity beyond reasonable doubt, if taken in isolation'.⁵³ Therefore, by simply suggesting to the jury that the DNA could stand on its own the trial judge had actually given greater weight to the DNA evidence than it was worth. The appeal against the rape conviction was subsequently found to be successful on this ground and a retrial was ordered.

Perhaps in response to the revelations of the problems caused by the 'prosecutor's fallacy', some recent cases have seen judges arguably overly cautious in allowing statistics to go to the jury. *R v G K*⁵⁴ was an appeal by the Crown arising from a trial in which the accused was found not guilty of sexual assault of his step daughter. The step daughter had actually had a baby and there was DNA evidence to show that the accused could not be excluded as the father. However, the trial judge refused to admit evidence of this probability, in numerical terms, derived from the DNA testing as it was believed there was a real risk of unfair prejudice to the accused. It was on this basis that the appeal was lodged by the Crown. On appeal it was found that statistics should have

⁵¹ *R v Smith* (1998) 71 SASR 543 at 554.

⁵² *R v Smith* (1998) 71 SASR 543 at 556.

⁵³ *R v Smith* (1998) 71 SASR 543 at 558.

⁵⁴ *R v G K* (2001) 53 NSWLR 317.

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been allowed to go to the jury, but that they should have been accompanied by appropriate directions from the trial judge so as to avoid the prosecutor's fallacy. The fact that the prosecutor's fallacy was a major cause for concern in the late 1980s and 1990s is probably not surprising, especially given that judges, juries and counsel alike were grappling to understand DNA evidence. An interesting cause for speculation is the extent to which DNA is, if at all, now operating in a better educated legal environment. There is little cause for complacency here, for it appears that the prosecutor's fallacy still remains a continuing problem today.⁵⁵

RE-EDUCATING LAWYERS?

If the way in which the information is being articulated in court is fraught with difficulties, what of the cross-examination process that is designed to elicit the truth of the matter? Cross-examination is intended to elicit all relevant information but only knowledge of scientifically acceptable procedures and scientific methodology and reasoning will fully equip lawyers in these situations to adequately inform the jury. The comments of Melbourne barrister and author of *Expert Evidence*⁵⁶, Ian Freckelton, are particularly pertinent in this context. Freckelton, who has extensive practical experience in this area, has written in particular of the failure of the cross-examination process in this context, a failure that partly derives from the lawyers' lack of knowledge of how to elicit information from the scientific expert witnesses. Another writer advances this observation about lawyers' understanding of DNA:

'There appears to be unanimity among commentators that lawyers are deplorably ill-informed about science and scientific methods. And this appears to be the norm ... As illustrated by the DNA cases, attorneys frequently fail to challenge the admissibility of unreliable evidence.'⁵⁷

This may still be because there is a continued need for education of the legal fraternity. However, in at least one recent case the interpretation of the DNA evidence was considered to be 'dubious'.⁵⁸

⁵⁵ Australian Law Reform Commission, *Protection of Human Genetic Information* (Discussion Paper no 66, 2002) 889-890.

⁵⁶ Freckelton, I. and Selby, H. *Expert Evidence*. North Ryde: Law Book Company, 1993.

⁵⁷ Kreiling, K. 'Scientific Evidence: Toward Providing the Lay Trier with the Comprehensible and Reliable Evidence Necessary to Meet the Goals of the Rules of Evidence' (1990) 32 *Arizona Law Review*, 915 at 936-937, cited in: Freckelton, I. 'Problems Posed by DNA Evidence: Of Blood, Babies and Bathwater' (1992) 17 *AHLJ* 10 at 10.

⁵⁸ Boettcher, B. 'Misleading DNA Testimony' (2001) 33 *Australian Journal of Forensic Sciences*, 75.

SCIENTIFIC COMPLEXITY AND JURY COMPREHENSION

One of the problems with DNA evidence is that due to its complexity it may be difficult for a jury to understand its significance. In particular, the situation is most difficult where a number of DNA experts provide conflicting opinions. When these circumstances arise it is up to the court to first determine if the evidence should be admissible. However, courts are generally hesitant to exclude DNA evidence on these grounds, more often preferring to allow the jury to resolve the conflicts. For instance, in *R v Maximo Pantoja*⁵⁹ the court refused to exclude DNA evidence on the basis that the evidence submitted by the scientific witnesses was conflicting. In this case the conclusions drawn from the DNA evidence by each witness were entirely contradictory, such that one witness had found the appellant could be excluded on the DNA evidence whereas the other found that he could not be excluded. The court felt that the jury would be capable of resolving the conflicts. Abadee J stated: 'The suggestion that the jury would not be able to make a reasonable assessment of the competing opinions should also be rejected'.⁶⁰ The court noted that there were criticisms that could have been aimed at some of the evidence. In particular, one of the experts had even found that the victim's DNA could be excluded, which was clearly inconsistent with other non-scientific evidence. Therefore, the court considered the jury would have been capable to decide whether the evidence was reliable.

On the other hand, courts are willing to exclude evidence where it is such that a jury could not intelligently interpret it. In *R v Miroslav Juric*⁶¹, an appeal against a murder conviction, it was stated 'the admissibility of such evidence must depend upon the judge's satisfaction that the jury can ... properly and reasonably evaluate the differing opinions expressed and make a responsible determination as to which of them is to be preferred'.⁶² During the trial, experts had provided differing opinions, however, there was *no scientific basis* upon which the jury could have preferred one opinion over the other. On appeal it was held that the evidence ought to have been excluded.

PLACING PRESSURE ON THE JURY?

⁵⁹ *R v Maximo Pantoja* (1996) 88 A Crim R 554.

⁶⁰ *R v Maximo Pantoja* (1996) 88 A Crim R 554 at 577.

⁶¹ *R v Miroslav Juric* (2002) 4 VR 411.

⁶² *R v Miroslav Juric* (2002) 4 VR 411 at 426.

⁶³ *R v Adams* [1997] 1 CrAppR 369.

⁶⁴ *R v Corbett* (1988) 41 CCC (3d) 385 (SCC). Addressed in the context of DNA evidence in: *R v Terceira* (1998) 123 CCC (3d) 1 (Ont CA), affirmed in: *R v Terceira*, [1999] 3 SCR 866.

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Clearly the very role of the jury is at issue in the context of DNA and crime. With some specialist exceptions in the United Kingdom, juries consist of ordinary citizens with no special training or knowledge in law or DNA. In England, the serious complexities of Bayesian Theory have been considered inappropriate for a jury⁶³, whereas in Canada, courts have rejected arguments that juries should be deprived of complex expert evidence due to its potential to cause unfair prejudice or confusion.⁶⁴ Instead the courts prefer to provide the jury with all relevant information but with a warning to not be overwhelmed by the aura associated with DNA evidence and to use their common sense in assessing the evidence.⁶⁵ The Australian Law Reform Commission confronts this difficulty in their Issues Paper 26⁶⁶ dealing with genetic information and asks what measures should be taken to ensure that juries are better informed about DNA science in order to understand and evaluate DNA evidence.

ADDITIONAL COMMENTS

The above sections highlight how the courts are grappling with the challenges that are created by the use of DNA evidence and, in doing so, are gradually developing guidelines for its admissibility. It should be noted that even where every step within a given procedure is properly performed it is still possible for an incorrect result to be produced by a DNA analysis. For example, even where the DNA is in good condition DNA profiling assays can still produce artefacts, such as band drop or even the inclusion of non-specific bands. These may change the profile and thus may distinguish two profiles that should otherwise be the same.⁶⁷ Further, in DNA paternity testing mutations have proved to be a problem. It is interesting to note that studies have unsuccessfully attempted to calculate mutation rates so as to ascertain their effect on paternity testing. The reasoning was that 5 to 10 per cent of the fathers used in these studies, upon analysis, were revealed not to be the true biological fathers of the children believed to be their own.⁶⁸ Probably the greatest concern regarding the admissibility of DNA evidence is that there has already been a documented case where DNA evidence

⁶⁵ *R v Terceira*, [1999] 3 SCR 866; *R v Terceira* (1998) 123 CCC (3d) 1 (Ont CA).

⁶⁶ Australian Law Reform Commission, *Protection of Human Genetic Information* (Issues Paper no 26, 2001) 409.

⁶⁷ Roberts, H. 'Interpretation of DNA Evidence in Courts of Law - A Survey of the Issues' (1998) 30 *Australian Journal of Forensic Sciences*, 29 at 32.

⁶⁸ Atchinson, B. and Redman, N. 'Interpreting DNA Evidence in Paternity Cases' (2000) 32 *Australian Journal of Forensic Sciences*, 75 at 79.

⁶⁹ Willing, R. 'Mismatch Calls DNA Tests into Question' USA Today, 8 February 2000; Cited in: Kirby, M. 'DNA Evidence: Proceed with Care' (2001) 33 *Australian Journal of Forensic Sciences*, 9.

provided an incorrect match with an innocent suspect. The incorrect match, which occurred in England, was calculated to involve only a one in thirty-seven million chance of error, yet the error actually occurred.⁶⁹

PLANTING DNA?

The above concerns are further compounded by the ease at which samples can be contaminated. Since the inception of DNA evidence in the courts, much controversy has been generated over this issue. One of the greatest fears is that it is possible for DNA evidence to be planted by the investigating police or even by the criminals themselves.⁷⁰ For instance, in *R v Lisoff*⁷¹ a quite convincing argument was submitted by the appellant that the blood found on his track suit pants was planted by the police. The basis of the argument was that the victim had received a blood transfusion *following* the offence, yet, the blood found on the pants appeared to be post transfusion blood, as it contained DNA that was foreign to the victim's DNA. Nevertheless, DNA contamination does not necessarily have to arise from such deliberate means. It can just as easily arise from poor collection, transportation, storage and testing of the specimens used in the investigation. Though, in most instances good laboratory technique and strict supervision by the courts will be enough to limit the potential for such errors to occur.⁷²

CONCLUSION

Although the advent of DNA evidence in the criminal court room was originally met with considerable debate, it has now become an increasingly more welcome aid in criminal trials. The major factors impacting on this change have been advances in DNA testing protocols as well as an increasing awareness of DNA evidential issues by legal practitioners. In addition, forensic laboratories have responded to a greater scrutiny of their results, by now ensuring that their laboratories are appropriately accredited and abide by the guidelines handed down by the courts. The issues for law, however, are being persistently reinvented. We may understand the prosecutor's fallacy but we have yet to deal with the lack of scientific knowledge on the part of lawyers that may have prompted it in the first place. The fallacy may therefore remain a reality in the courtroom even if the statistics are presented somewhat differently. We may have dealt with the representativeness of

⁷⁰ Kirby, M. 'DNA Evidence: Proceed with Care' (2001) 33 *Australian Journal of Forensic Sciences*, 9 at 10.

⁷¹ *R v Lisoff* (unreported) [1999] NSWCCA 364 (22 November 1999).

⁷² Freney, L. and Ainsford, T. 'DNA in Forensic Science - Infallible Crimebuster?' (1999) 1 *Proctor*, 16.

the database issue that was prominent in the early 1990s but we have yet to deal with the conflicts between expert opinion that may prompt a complete exclusion of what could be highly relevant evidence. Nor is law clear as to the ways in which the taking of the sample can ensure that an 'OJ' argument cannot be run. Future issues may include arguments about 'crime genes' for which current principles concerning tendency evidence may ill prepare us. Irrespective of these potential issues, the development of guidelines for DNA admissibility by courts is a continuing process. Subsequently, the use and credibility of DNA evidence in criminal proceedings will continue to grow.