

# **Issues in Gathering, Interpreting and Delivering DNA Evidence**

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**District Court New South Wales**

Presented at the Expert Evidence Conference  
Canberra

February 2011

Organised by the National Judicial College of Australia and the ANU College of Law

## INTRODUCTION

DNA<sup>1</sup> matching is a wonderful investigative tool. A profile taken from the DNA of a suspect can be compared with the profile of a sample of DNA taken from a crime scene. A statistically validated “match” between these profiles is compelling evidence that they come from the same source. It may or may not, depending on the other evidence, be compelling evidence of guilt. DNA evidence can also provide convincing evidence of a person’s innocence. Profiles can be stored on a computer database. They can be easily crosschecked and any linkage between a crime scene and a suspect’s DNA sample investigated.

In this presentation I do not intend to deal with DNA science, testing or how the statistics which add weight to the DNA analysis are calculated or the procedures set out in the *Crimes (Forensic Procedures) Act 2000* (the Act).<sup>2</sup> Here are however 6 points to remember about the science and statistics. Unless we have an identical twin every one of us has unique nuclear DNA.

1. There are commercially available kits that allow DNA to be extracted, processed and converted into a profile that allows for its analysis and comparison with other samples of DNA.
2. The DNA profile is obtained from only a small fragment of a person’s DNA. As a consequence it cannot be said that the profile is unique.
3. The rarity or otherwise of the profile can be calculated using models based on statistical rules adjusted to take account of what we now know about population genetics.
4. All models are wrong.
5. No police investigation, expert opinion or scientific process is infallible: humans are involved.

I also presume that Australian law has reached the stage where there are no major issues that prevent DNA profile match evidence and the accompanying statistics being presented to courts, if supported by expert opinion that the results are scientifically and statistically valid and validated.

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<sup>1</sup> Deoxyribonucleic acid - DNA is found in all cells, except red blood cells.

<sup>2</sup> Reviews of the science, statistics and law can be found in a many learned articles and a number of papers available on the Public Defenders webpage- Web <http://www.lawlink.nsw.gov.au/publicdefenders>. Here are however 6 points to remember about the science and statistics. Unless we have an identical twin every one of us has unique nuclear DNA. There are commercially available kits that allow DNA to be extracted, processed and converted into a profile that allows for its analysis and comparison with other samples of DNA. The DNA profile is obtained from only a small fragment of a person’s DNA. As a consequence it cannot be said that the profile is unique. The rarity or otherwise of the profile can be calculated using models based on statistical rules adjusted to take account of what we now know about population genetics. All models are wrong. No police investigation, expert opinion or scientific process is infallible: humans are involved.

DNA evidence even if properly presented can be misunderstood.<sup>3</sup> DNA's apparent certainty can be deceptive. It can be misused and misapplied. DNA evidence and the apparent weight given to match results by statistical calculations still present significant challenges to the criminal justice system. These challenges affect, or in some cases afflict, how DNA evidence is gathered and interpreted and how it is presented and explained in Court. I want to look at two critical issues. I will do so in the context of two recent decisions: the High Court special leave application of **Forbes**<sup>4</sup> and the appeal against conviction to the NSW Court of Criminal Appeal in **Aytugrul**.<sup>5</sup> Those issues are:

1. What happens when a DNA profile match is the only evidence said to identify an accused; and
2. Can an unfair trial result from the way statistical evidence supporting a DNA profile match is presented?

Both issues raise, in their own way, my central thesis: there remains an ever present danger that uncritical acceptance of DNA evidence can lead to miscarriages of justice.

#### **WHERE DNA IS THE ONLY EVIDENCE OF IDENTITY**

On 11 March 2005, at about 10:00pm a young girl was walking home from work along a Canberra bike path. She was attacked, indecently assaulted, and forced to perform fellatio on her attacker. She described him as being in his late 30's. She said his penis was circumcised. Male DNA, including semen, was found on her body and clothes. A DNA profile was obtained. It was later matched to the profile of Mr Forbes. Forbes lived in Canberra. He was not circumcised. The victim failed to identify Forbes from a photo-board display. He was convicted despite his denials and alibi evidence.

Forbes appealed his conviction on the ground that the conviction was unsafe. The ACT Court of Appeal dismissed the appeal. They said nothing advanced by the defence caused them to doubt the correctness of the jury verdict.<sup>6</sup>

Forbes' defence team sought the special leave of the High Court of Australia to decide the question: is there a rule of principle that where DNA is the only evidence incriminating an accused he or she must be acquitted?

#### **The state of the law on the issue**

In all States and Territories evidence of a DNA profile match between a suspect's sample and a crime scene sample is admissible as evidence going to a fact in issue in a case.

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<sup>3</sup> M Findlay & J Grix, *Challenging Forensic Evidence*, (2003) 14 Current Issues in Criminal Justice 269 at 273.

<sup>4</sup> [2010] HC Trans 120.

<sup>5</sup> [2010] NSWCCA 272

<sup>6</sup> **Forbes v R** [2009] ACTCA 10.

There is no general rule saying how a jury or judge is to assess DNA evidence. There is no general rule saying whether such evidence alone is enough to establish the identity of an offender and thus secure a conviction.

In New South Wales the Court of Criminal Appeal has held that a DNA profile match could not in the absence of other evidence prove beyond reasonable doubt that the accused was responsible for leaving the crime scene stain: **R v Green**, unreported CCA NSW 26/3/1993; **R v Pantoja** (1996) 88 A Crim R 554 & **R v Milat** (1996) 87 A Crim R 446 at 447. Since those relatively early decisions DNA evidence has been considered on many occasions but the specific issue has not been decided at the appellate level.<sup>7</sup> The present Chief Justice has said that while in the past the courts have approached DNA evidence with caution that caution is naturally abating as experience with the use of such evidence has grown: **R v JCG** (2001) 127 A Crim R 493.

Victoria's Court of Appeal, similarly, has held that DNA profiling establishes no more than that the accused *could* be the offender: **R v Noll** [1999] 3 VR 704 at [25]. This point is taken up in Victoria's Judges' Bench Notes at paragraph 4.13.2.2, Charge: DNA Evidence.<sup>8</sup> Despite this, in July 2008, after a trial in the Melbourne County Court Farah Abdulkadir Jama was convicted of rape and sentenced to six years gaol after his identity was 'established' by DNA found on a swab said to have been taken from a woman who claimed she may have been raped while unconscious. The jury rejected Mr Jama's alibi and convicted despite there being no evidence he had been anywhere near the woman. A subsequent judicial enquiry<sup>9</sup> found that Jama's DNA had been allowed to contaminate the crime scene sample because of faulty collection procedures.

In South Australia their Court of Appeal has dismissed appeals where DNA was the only evidence of the identity of the offender. DNA evidence is regarded as being safer than other identification evidence: see **R v Rowe** [2004] SASC 427 & **R v Gumm** [2007] SASC 311 at [32]. The general view is that a jury can convict if the DNA is properly evaluated in the

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<sup>7</sup> The question was raised recently in **Talay v R** [2010] NSWCCA 308 but the appeal was dismissed on procedural grounds. At [65] Howie AJ, in an obiter comment, said he did not believe there was merit in the application.

<sup>8</sup> "Even if you accept [the] evidence, that does not necessarily mean that [accused] must be guilty of the offences charged. It is just one piece of underlying circumstantial evidence that must be considered in the light of the other evidence in the case. You will remember...it is important that you recognise the limitations of DNA evidence. People sometimes think that such evidence can prove who committed an offence. This is wrong. DNA evidence can never establish a person's guilt. All that DNA evidence can do is prove that [the accused] could have been the person... it cannot prove that she/he definitely was that person. In other words, the DNA evidence given cannot rule out the possibility that someone else was responsible for the [forensic sample]... You must consider all of the evidence in this case and decide whether it is possible that someone other than the accused could have been responsible for the [forensic sample]".

<sup>9</sup> "Inquiry into the circumstances that led to the conviction of Mr Farah Abdulkadir Jama." Justice Frank Vincent AM May 2010

context of all the other evidence: **R v Karger** (2001) 83 SASR 135.<sup>10</sup> A fine example of a standard direction can be found in **R v Carroll** [2010] SASC 156, (a case where there was some other evidence).

The Queensland Court of Appeal made similar points to that in **Karger** in **R v Fletcher** (1998) 2 QR 437.

The Scottish courts have taken a very robust view of DNA evidence. In the absence of innocent explanation even DNA found on a portable item such as a woollen mask has been held to sufficient to sustain a conviction: **Maguire v HM Advocate** [2003] SLT 1307.

In England it has been held that there is no principle of law that DNA evidence of itself is incapable of proving guilt: **R v Adams** [1996] 2 Cr App R 467 at 469. However, it is also said that there is no rule about when it is safe to leave statistical calculations to a jury: **R v Watters** [2000] EWCA 81. There have been indications that the court will instruct a jury that where the DNA evidence stands alone they could not convict: **R v Reed** [2009] EWCA 2698. The general view appears to be that the significance of the DNA depends on the evidence in the individual case and how it is to be assessed depends critically upon what else is known about the accused: **R v Doheny and Adams** (1997) 1 Cr App R 369 at 373. There, Phillips LJ, noted that the stage had not yet been reached when a match will be so comprehensive that it will be possible to construct a DNA profile that is unique and which proves the guilt of the defendant without any other evidence.

United States courts have rejected the idea that DNA evidence alone cannot convict: **Rush** 672 NYS 2d 362. DNA evidence is regarded as better than visual identification evidence and treated as highly reliable. However, it has been recognised that there are many things that can go astray; the theory is not always matched by practice. DNA often fails to provide the absolute proof it promises: see **DA v Osbourne** 556 US - 2009.

### **Back to Forbes**

At trial the defence were justifiably concerned with how the DNA evidence was presented, given that the accused's profile was expected to occur in fewer than 1 in 20 billion individuals in the general population. It was agreed that rather than these numerical values would be put in a verbal form as - 'strong' with a likelihood ratio of greater than 10,000 and lower than 100,000; very strong with a likelihood ratio of greater than 100,000 and lower than 1,000,000; and, 'extremely strong' where the likelihood ratio was greater than 1,000,000.

The prosecution experts made other proper and important concessions. These included that: the results were based on profiles not the actual individuals' whole DNA; only a tiny portion of a persons actual DNA was used; and, they could not say the DNA from the crime scene

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<sup>10</sup> See below at pages 13 & 14.

was actually that of the accused. They also noted that the numbers used to assess the verbal scale used were estimates of rarity, they are not real numbers nor were they based on real observations. They emphasised the need for caution. We know the jury accepted the DNA evidence and rejected the alibi evidence as they convicted Mr Forbes.

### **To the High Court**

Before the High Court will consider an appeal it must be shown that the matter or the issues raised are of particular importance to the law or the administration of justice in Australia. Only a small proportion of applicants are granted special leave to appeal. Forbes' team excited the interest of two judges, sufficient for them to invite them to argue the special leave question in front of a full bench of 5 judges. That additional special leave hearing took place on 18 May 2010.

The defence argued for a rule of principle: that where DNA is the only evidence incriminating an accused he or she must be acquitted. It was said this conclusion was inevitable given the fundamental principles that underpin DNA profile matching.

The prosecution acknowledged that the general question was an important one that needs resolution however they argued this was not the right case to test the question. They asked: why should DNA evidence be in a special category? The following points were made: Eyewitness evidence is allowed despite its inherent unreliability; an accused can be convicted on unsupported identification from photographs; whole categories of evidence are recognised as unreliable but are still admissible and able to found guilt;<sup>11</sup> when DNA evidence is led three potential issues emerge: issues of contamination, kinship and coincidence; here only the coincidence issue was in real dispute. And finally, as the defence allowed the issues to put in a particular way and derived some forensic benefit from doing so they could not now complain that the evidence wasn't good enough.

In response the defence stressed that DNA must be regarded as being in a conceptual class of its own because the strength of any profile match was governed by a statistical estimate. As guilt should not be determined solely by such an estimate some other evidence was required.

The High Court accepted the prosecutions' final point and refused special leave. They left the critical question unresolved.<sup>12</sup>

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<sup>11</sup> For examples see s. 165 *Evidence Act*.

<sup>12</sup> ***Forbes v The Queen*** [2010] HC Trans 45.

## The future

We must wait on another test case before we can say whether a general rule is accepted. In the meantime cases where DNA is the sole evidence of identity are coming before the courts. And miscarriages of justice have occurred. How then are we to ensure fair trials?

One simple response is to say: If DNA evidence is properly collected and observed and an expert, properly qualified, gives evidence of their analysis and results that evidence should be admissible and a jury (or judge as fact finder) should be entitled to rely on that conclusion, as occurs with evidence of visual and voice identification and fingerprints. If any “additional” circumstances are necessary they can be found in evidence about the type of substance from which the DNA is extracted and where it was found.<sup>13</sup>

To allow a jury (or a judge) to find guilt because of evidence of a DNA, profile match and supporting statistics assumes four things, which are far from certain. It assumes:

1. That the statistical calculation given is real as opposed to one of a number of possible statistical or mathematical construct that could be used to make an estimate of the profile's rarity.
2. That the allowances made for the impact of the distribution of and variations between DNA profiles in families and general and specific populations are accurate.
3. That there has been no contamination in the collection or analysis of the sample.

And,

4. That the statistical evidence interpreting the significance of the DNA match is evidence of the probability that the appellant was the source of the incriminating DNA rather than one of a number of circumstances that may be taken into account in reaching that conclusion.

JM Butler one of the most respected figures in the field of DNA analysis made this critical point:

*“It is important to realise what a random match probability is not. It is not the chance that someone else is guilty or that someone else left the biological material at the crime scene. Likewise it is not the chance of the defendant being guilty or the chance that someone else in reality would have that same genotype. Rather, a random match probability is the estimated frequency at which a particular STR profile would be expected to occur in the population. This random match probability may also be thought of as the theoretical chance that if you sample one person at random from the population they will have the particular profile in question.”<sup>14</sup>*

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<sup>13</sup> The problem with this approach was illustrated by Mr Jama's case, discussed below

<sup>14</sup> JM Butler *Forensic DNA typing, biology, technology and genetics of STR markers*, 2nd ed, 2005, Elsevier Academic Press, Burlington, USA, p 500

This caution is maintained in the standard annexure that accompanies each DNA match report prepared by the NSW Department of Analytical Laboratories:

*“The final statistical calculation...does not prove uniqueness, but provides strong support for the hypothesis (without taking other evidence into account) that DNA from the evidence sample originates from the matched individual. The profile frequency calculation does not apply to closely related individuals.”*

Courts cannot ignore the human element, by which term I mean the dangers associated with the giving of expert but subjective opinion about ostensibly unimpeachable data: opinions, which are often impossible to test in or outside the courtroom. Courts cannot ignore the fact that we are dealing with such small samples that the possibility of secondary transfer and possible contamination and even corruption are ever present dangers. Contamination can occur despite the procedures in place to deal with them. Courts cannot ignore the limitations placed on any police prosecution or defence investigation, by cost constraints and other resources issues.<sup>15</sup> There are some things that may never see the light of day.

### **Taking care with statistics**

I want to take you to a delightful book on math by Edward Burger and Michael Starbird “Coincidence, Maths and all that Jazz”, Norton, NY, 2006. The authors simply set out a number of examples of how we can lie with statistics and how common sense assumptions about probability too often turn out to be wrong. One example they give, involves a quick quiz:

There are 365, and in leap years, 366 days in the year. If we have a group of 45 people what is the probability of a birthday being shared? 45 goes into 366 about 8 times. So there are 8 chances in 366 or a 1 in 45 chance of a match? 8 into 366 works out at about 2.2%?

The correct answer arrived at by asking what are the individual chances of a match and, as with DNA statistics, applying the product rule is just under 95% chance of a match! What is a coincidence looks almost certain.

Other examples of misunderstanding statistics can be poignant. One victim of the recent Brisbane floods remarked to a TV News reporter:

“I built this place just after the land went under in the 1974 floods. They said then it was a in 100 year flood so I thought we was safe till about 2074.”

Burger and Starbird point out that while coincidences are by definition rare events it is even rarer to get no coincidences at all. The more information collected the more the chance of coincidental matches. Real life throws up things that probability which deals in generalities,

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<sup>15</sup> *In appeal cases mention is sometimes made of the fact that the defence did not produce evidence or enough solid to raise or prove issues of contamination, relationship, and alibi or seek to rebut the DNA: for example, in both Jama and Forbes’ trials alibi evidence was rejected by the jury. While an appellant has an onus to establish their ground of appeal, care must be taken not to place on the defence a burden of proving innocence at trial.*

cannot. DNA is evaluated at the level of whole populations. It can never predict exactly what happens at an individual level.

Expert evidence can demystify or obfuscate but it must always be remembered that life itself is, for those of us who do not accept a designed universe, a series of incredible and unlikely events all strung together. Numerical measures help us make intelligent guesses but they need careful thinking in their application. As the authors point out numbers don't lie but their application allows them to fib a little.

A doctoral research study of juror's reactions to DNA evidence produced the following illuminating responses:<sup>16</sup>

- *"DNA is a life boat in a sea of lies."*
- *"DNA is crucial, we want answers, we want it from the scientific evidence."*
- *"We rely on the experts, we want answers".*
- *"How did they convict people in the old days?"*

Most of us would admit to similar opinions. As judges, lawyers, experts and potential jurors we all want evidence and results that make our already difficult jobs easier. We would love some expert to ease the burden of judgment by saying, "this is the answer". If only it were that easy. We need to be acutely conscious of the limitations of DNA evidence. In 2002 journalists in the USA coined the phrase "CSI effect". It refers to the suggestion that jurors who watch fictional crime scene television programs such as CSI have changed their requirements for delivering a verdict according to the presence or absence of forensic evidence.<sup>17</sup>

The CSI effect has two quite contradictory elements. The first is that jurors may be overwhelmed by the presentation of expert evidence and convict, because of a tendency to overrate DNA evidence. As a consequence the introduction of DNA evidence may result in more convictions than are warranted.<sup>18</sup> The second aspect is where jurors ask for or demand additional forensic evidence and refuse to convict where there is an absence of forensic evidence.<sup>19</sup>

Jane Goodman Delahunty has published a number of articles in which jury studies have highlighted the following simple proposition: "Jury exposure to DNA evidence significantly increased conviction rates."<sup>20</sup> Her other studies however were more positive. Despite jury

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<sup>16</sup>Rhonda Wheate, unpublished PhD thesis, ADF Academy/UNSW, May 2006.

<sup>17</sup> Jenny Wise, *Providing The CSI Treatment, Current Issues in Criminal Justice*, vol. 21 no.3 p 383.

<sup>18</sup> Goodman-Delahunty J and Tate D (2006) DNA And The Changing Face Of Justice. *Australian Journal of Forensic Science*, vol 38, pages 97-106.

<sup>19</sup> Franzen R (2002) CSI Effect On Potential Jurors Has Some Prosecutors Worried. *Santiago Union Tribune* 16 December 2002.

<sup>20</sup> *Improving jury understanding and use of DNA expert Evidence: report to the CRC June 2009 at 43.*

difficulties understanding DNA evidence there appeared to be less risk that jurors would overweigh DNA evidence at least in the context of relatively weak DNA in a circumstantial case.<sup>21</sup>

Another ACT case highlights how the possibility of contamination can be missed despite thorough representation by prosecution and defence. It was alleged Mr Hillier murdered his wife. It was only after a trial, three appearances before the ACT Court of Appeal and one before the High Court that evidence was found pointing to the possibility of contamination in the police exhibit room; contamination that created enough doubt to result in an acquittal.<sup>22</sup>

Another example comes from articles from 'The Age' from 22 July 2008 and 8 August 2008 involving the strange case of Mr Gesah. The Police initially put out a press release trumpeting the imminent arrest of a suspect in case where it was assumed a DNA 'match' had the case all sewn up. The retraction and denouement came soon after. It appears that the statistical probability that the "match" was the result of chance or contamination was significantly higher than any chance Mr Gesah was the perpetrator.

That someone, presumably from the Victoria Police Forensic Services Division (*VPFSD*), picked up the error and did so quickly and publicly was a good and remarkable thing. In many cases particularly those where expert certificates are tendered unexamined and relied on and the worksheets for each analysis are not individually checked, the mistake would never be picked up.

Other "mistakes" can be found in two recent Reports, again from Victoria. The first is the April 2010 "Review of DNA Reporting Practices of by Victoria Police Forensic Services Division" by Professor Jim Fraser, Dr John Buckleton and Dr Peter Gill. The Second is the May 2010 Report of Justice Frank Vincent AM "Inquiry into the circumstances that led to the conviction of Mr Farah Abdulkadir Jamal." <sup>23</sup>

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21 Enhancing juror understanding of Probabilistic DNA evidence S. Dartnell and J Goodman Delahunty, *Australian Journal Of Forensic Science* 38(2): 85-96. In an article in (2005) 29 *Crim LJ* 71, Ten things about DNA Contamination that Lawyers should know, Kirsten Edwards, drew our attention to potential fallibility of DNA laboratory results.

<sup>22</sup> See *Hillier v R* at (20007) 233 ALR 634 & [2005] ACTCA 48 & [2008] ACT 3, [2004] ACTSC 81 & [2010] ACTSC 33

<sup>23</sup> Some of the risks attaching to DNA evidence are only now becoming apparent. "The highly subjective nature of the mathematical process remains concealed behind the apparent certainty of a bald statistic", Mathew Goode, "Observations on evidence of DNA frequency" (2002) 23 *Adelaide Law Review* 45 at 66–67. .Examples include; the Eichelbaum-Scott report on DNA in New Zealand in 1999 The Rt Hon Sir Thomas Eichelbaum and Professor Sir John Scott, Report on DNA anomalies for The Hon Tony Ryall, New Zealand Minister for Justice, 30 November 1999 the inquiry in Victoria into how a female crime victim's DNA was found in the Jayden Leskie murder, and the number of what are called "unresolved pairs" often found when the data bases are searched for unexplained matches. *Forensic DNA Evidence Interpretation*, Buckleton, Triggs & Walsh CRC (USA) 2004 page 463. In 2005 Walsh and Buckleton reviewed Aboriginal DNA data bases for the National Institute of Forensic Science, in an unpublished report "on Duplicate detection" they noted that out of a sample group of 33,858 there were 1,575 matches, 206 occurred at 9 loci or greater. They explained these as being;

The Fraser review made three key findings:

1. The software used by VPFSD was not designed to deal with allele drop out and had led to systematic error in favour of the prosecution.
2. Interpretation errors in some profiles had wrongly led to them being identified as mixtures or complex mixtures in too conservative a manner thus favouring the defence.
3. There had been inconsistency in interpretation of the DNA profiles by different case managers in VPFSD.

The resulting recommendations and training led to the lifting of a suspension on the interpretation of DNA profiles by the VPFSD earlier imposed by the Police Commissioner.

Justice Vincent was dealing with a case where a young man, a Somali refugee, had been accused of rape based solely on the finding of semen, said to match his to a very high probability, found on a swab or slide taken from a woman who was found unconscious in a nightclub toilet. She believed she might have been drugged although no trace of any drug was found in blood tests. CCTV at the nightclub showed no one who looked like Mr Jama. In fact, the only indication there had been a rape was the finding of the semen sample. Mr Jama was convicted and spent 14 months in custody. The woman's Victim Impact Statement revealed she had suffered from 'knowing' that she had been raped while unconscious.

Investigations initiated by the Office of Public Prosecutions, after an appeal was lodged, revealed that a day or so before the woman was medically examined another woman who had had a sexual encounter with Mr Jama was examined by the same doctor in the same examining room. Justice Vincent concluded that it was possible there was a high possibility transference of a microscopic amount of material containing the DNA of Mr Jama because of the environment in which the two women were examined. His Honour's report and recommendations make for a disturbing read and contain a salutary lesson about how things can go wrong and how little errors can be compounded by those acting with the best intentions. A single piece of evidence supported by evidence of statistical probability of a high order was used to establish both the commission of a crime and the identity of the supposed perpetrator. His Honour concluded, at page 37:

*"In the present case, the obviously unreserved acceptance of the reliability of the DNA evidence appears to have so confined the thought that it enabled all involved to leap over a veritable mountain of improbabilities and unexplained aspects that, objectively considered, could be seen to block the path to conviction."*

Problems with making assumptions about DNA evidence are illustrated by a recent case in the NSW Court of Criminal Appeal (which will be discussed in more detail when I come to

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coincidental matches between unrelated individuals, the same person giving more than one sample under an alias, close relatives matching or identical twins matching. The report also noted that in New Zealand a similar review had found 64 unresolved matches from a database of 50,000 people.

consider the second question about the use of percentages). In **Aytugrul** [2010] NSW CCA 272, Justice Simpson started with a common premise<sup>24</sup> about DNA evidence:

*“Commonly, the sample from which DNA is drawn for testing against that of a suspect is taken from the victim or from the crime scene. There is a high degree of probability, sometimes tantamount to certainty, that the source of the DNA sample (sometimes called “the crime stain”) is the perpetrator of the crime: that is, that once the source of the crime stain is identified, so is the offender.”* (At [126] emphasis added.)

And, at [162]:

*“The role of the expert witnesses ... is, to ... show how the results impact upon the likelihood that the person accused or suspected is the source of the sample said to link him or her with the crime, or the crime scene. (It is not the role of the expert witnesses to express their own conclusions with respect to that question: *R v Doheny and Adams* [1996] EWCA Crim 728; (1997) 1 Cr App R 369). The task is to give this explanation in a way that non-scientific members of a jury can comprehend.”* (emphasis added.)

It may be that her Honour was simply saying that the DNA expert could assist the jury with their role in assessing the identity of the offender, a conclusion they could not reach unless they accept him or her as the source of the crime scene sample. It may be asked: what is wrong with jurors equating a low likelihood ration with guilt; if the statistics are good enough why not use them to convict?

My response is we are talking about a DNA profile not a match of a person’s whole DNA strand. Expert evidence as is based on a number of assumptions. Expert statistics evidence goes to a fact in issue but how it is expressed and explained, even if assumptions, are spelt out can give the evidence of a profile match significantly greater weight than it is capable of bearing. This can that lead to the assumption: *“there is a high degree of probability, sometimes tantamount to certainty, that the source of the DNA sample (sometimes called “the crime stain”) is the perpetrator of the crime.*

While care must be taken, juries are generally regarded as robust<sup>25</sup> and able to follow and heed directions. However, they (and by that I mean we all) can be overawed by evidence of opinion in scientific garb or exaggerated popular opinion of the accuracy of particular techniques.<sup>26</sup> At best the evidence provided support for the proposition it was Aytugrul’s hair found at the crime scene, nothing more.

The most an expert can ever do is show how the results impact on the likelihood the profile from the accused matches that taken from the crime scene, not the probability it is his or her DNA. If this is accepted the DNA evidence cannot of itself no matter what the probability

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<sup>24</sup> See Spigelman CJ in **R v Galli** [2001] NSWCCA 504; 127 A Crim R 493.

<sup>25</sup> **Lisoff v R** [1999] NSWCCA 364

<sup>26</sup> **R v Milat** (19996) 87 A Crim R 446, at 448, per Hunt CJ at CL.

attached to it prove the critical fact of identity in issue. As Doyle CJ pointed out in **Karger** at [12], one reason for warning a jury about DNA statistics is:

*“The risk that the jury<sup>27</sup> will reason that the evidence of the likelihood ratio or match probability expresses the probability that the incriminating DNA was the DNA of the accused”.*

### **Directions are essential**

In **Karger**, Doyle CJ noted that a jury must be properly instructed about how the DNA evidence is to be used. He did not favour a general warning. Rather he stressed a DNA direction must be relevant to the particular trial and the evidence before the court. He said it was critical the jury to appreciate three points if they are to make proper use of the statistical evidence:

1. The statistical evidence interpreting the significance of the DNA match is not evidence of the probability that the appellant was the source of the incriminating DNA. To so regard it would be to make an error.
2. The statistical evidence interpreting the DNA match is expert evidence that the jury could use in deciding whether it was satisfied beyond reasonable doubt that the appellant was the source of the incriminating DNA.
3. The statistical evidence is undeniably strong evidence pointing to a conclusion that the accused was the source of the incriminating DNA, but is not direct evidence of that fact. And, as is obvious, the statistical evidence must be considered in the light of other evidence in the case. It is necessary for the jury to appreciate these points if they are to make proper use of the statistical evidence.<sup>28</sup>

The Supreme Court of British Columbia<sup>29</sup> has suggested that before DNA evidence is presented to a court it should be made sufficiently clear that:

- the estimates are not intended to be precise;
- they are the products of mathematical and scientific theory not concrete facts;
- they do not purport to define the likelihood of guilt;
- they should only be used to form a notion of the rarity of the genetic profile of the accused; and
- the DNA evidence must be considered along with all the other evidence in the case relating to the issue of identification.

A direction must be cogent and effective. As a former defender I take the view that directions couched as warnings are more effective. The direction or warning must be appropriate to the circumstances of the case; it will lose its effect and impact if, for example, the DNA evidence is not in dispute. A judge must identify and identify any matter of significance in other words it must accord with what was said by the High Court, of identification evidence, in **Domican**

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<sup>27</sup> Or I interpolate here, a judge.

<sup>28</sup> At [16] and [17].

<sup>29</sup> Australian Law Reform Commission, op cit n 45, Part J, Law Enforcement and Evidence Chapters 39–46, [44.50]. In the United Kingdom suggested guidelines can be found in *R v Doherty* [1997] 1 Cr App R 369 and in the Northern Territory in *Latcha v The Queen* (1998) 104 A Crim R 390.

*v The Queen* (1992) 173 CLR 555 and be in similar form to that required by s116 of the *Evidence Act*.

Such a warning or direction does not underestimate the intelligence of the average juror.<sup>30</sup> The danger caused by the seductive impact of DNA statistical evidence is too great.

### **A warning will not suffice if the only evidence of identity is DNA**

It will be a rare case that the only circumstance identifying the accused and linking him to the crime is a purported DNA match as the facts of Mr Jama's case illustrate. In *Forbes* it is arguable that there was additional evidence. Such cases are however becoming increasingly more likely in high volume crimes such as break and enter: see for example *Talay v R* [2010] NSWCCA 308 and the decision of Magistrate Heilpern in *Police v Le Platrier* [2010] NSWLC 22.<sup>31</sup>

In his *Jama Report* Justice Vincent noted<sup>32</sup> there was no formal bar to a conviction based solely on DNA evidence. There is sound law which indicates that a judge cannot withdraw a matter from a jury just because the judge thinks that the evidence is unsatisfactory, not cogent enough or that a jury might have trouble with the expert evidence: see *R v R* (1989) 44 A Crim R 404 and *R v Lisoff* [1999] NSWCCA 364. It is arguable that where the DNA match is the only evidence identifying an accused a court could say that that element of the offence has not been proved and the matter can be withdrawn for want of proof. The view most consistent with authority, however, is that as there is some evidence of identity it should be left to the jury. That said as Justice Vincent notes:

*"The better view is that a conviction should only be returned where there is DNA evidence and at least one other item of evidence present which is consistent with the guilt of the offender".*

I agree. There are reasons to be careful. Any conviction based solely on DNA will result in a miscarriage of justice.

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<sup>30</sup> I recognise the force of what was noted by Brennan CJ of *Domican* when he cited what Young C.J. said in *Reg. v. Haidley and Alford*: (1984) VR 229, at p 230, "To require trial judges to recite or refer to numerous propositions which could by the application of ingenuity be thought to be possibly relevant to the consideration of evidence of identification, tends not only to underestimate the intelligence of the average jury but also to make a judge's charge appear absurd..."

<sup>31</sup> Where the only evidence was a match with a the 1 in 10 billion likelihood ratio but where the prosecution have not negated the hypothesis that a brother of the defendant with a 1 in 6252 shares the same DNA profile and thus is the perpetrator of the crime.

<sup>32</sup> at p.45.

## CAN AN UNFAIR TRIAL RESULT FROM THE WAY STATISTICAL EVIDENCE SUPPORTING A DNA PROFILE MATCH IS PRESENTED?

In November 2005 Ms Bayrak a member of Sydney's Turkish community was stabbed to death in her flat.<sup>33</sup> Suspicion focussed on her current and former boyfriends. The current boyfriend had been with deceased the night before her death. His DNA and that of another unknown male was found on her face.

There was evidence the former boyfriend, Mr Aytugrul, was pursuing the deceased and had demonstrated a romantic interest in her, an interest that had been rejected. He also lied to investigative Police. Importantly, although he said he had not been to the deceased's flat, a hair, which could have been his, was found in blood stuck to the deceased thumbnail. The hair could have been picked up from the carpet on which the body lay before discovery and/or it could have come directly from her attacker.

No hair root was attached so a profile using Mitochondrial DNA was obtained. Such profiles do not allow for the same high level of statistical support offered when Nuclear DNA is used. Putting to one side a relatively minor, if interesting, disagreement between the experts each said the profile was relatively rare. All gave similar figures for persons other than Mr Aytugrul being expected to have a DNA profile matching that extracted from the hair (called at trial random occurrence ratio). They were - from 1 in 2,000, 1 in 1,600 and 1 in 1,000 in the general population and between 1 in 50 and 1 in 100 in the Turkish population. At the request of the trial judge, the defence expert Dr Buckleton expressed "1 in 1000" as an exclusion percentage of 99.9%.

On appeal the defence argued that the conviction was unreasonable because the evidence was simply not good enough to found a conviction and that a miscarriage of justice had occurred because of the unfairness inherent in how the DNA evidence had been put to the jury. Reliance was placed on two earlier decisions of the NSW Court of Criminal Appeal, **GK v R** (2001) 53 NSWLR 317 and **Galli v R** (2001) 147 A Crim R 493. In **GK** the court had accepted the correctness of a trial judge's ruling that evidence, presented in percentage terms, that there was a chance of paternity of 99.99993%, was properly excluded. Justice Sully said this was because of the combined risk of unfairness derived from the subliminal impact of the raw percentage figures and because the Crown could use other compelling figures.<sup>34</sup> President of the Court of Appeal Mason agreed and added<sup>35</sup> that there was an unduly prejudicial impact of a 99.99993% figure and its transposition a 0.0003% probability or chance of the child's father being anyone other than the accused.

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<sup>33</sup> **Aytugrul v R** [2010] NSWCCA 272.

<sup>34</sup> At [110]

<sup>35</sup> At [60]

In **Galli v R** (2001) 147 A Crim R 493, the Chief Justice accepted that percentage figures “may mislead the jury and lead it to give the evidence greater weight than it ought to be given.”<sup>36</sup>

It is the second ground that is of particular interest, as the Court was divided on how the presentation of the DNA evidence impacted on the fairness of the trial. Justice Simpson (with whom Justice Fullerton agreed) saw no unfairness in the way in which the evidence was presented. Her Honour noted that the DNA evidence was not objected to and was clearly admissible.

To be comprehensible it needed to be interpreted and explained by an expert. Admissible evidence includes:

- a) Evidence of the finding of a Crime Scene Stain
- b) Evidence DNA was extracted from it
- c) Evidence that DNA was tested
- d) A comparison of the DNA profile from the Crime Scene Stain with DNA profile from the accused.
- e) Expert opinion that the profiles match and the extent of the match.
- f) Expert opinion based on statistics and population genetics as to the probability some other person other than the accused has the same profile as that in the Crime Scene Stain.

What was in issue in **Aytugrul** was how f) was expressed. Her Honour said that here are various ways of expressing, in non-scientific terms, the conclusions to be drawn from DNA testing:

*“Some formulations are likely to have greater impact than others. That merely means that some formulations have a greater educative force or persuasive appeal than others; or that some are more colourful, or more easily comprehended, than others. Provided that what is contained in the formulations is accurate, I see no reason to prefer one method of expression over another. ... provided the various means of expressing the conclusions correspond accurately with one another, there is no reason to prefer one over another.”* At [164]

Her Honour could not see how otherwise admissible evidence could be said to be unfair simply because of how it was expressed. She acknowledged what was said in **GK** and **Galli** but held that neither case stood for the proposition such exclusion percentages were never admissible.

On the other hand Justice McClellan, in dissent, while recognising that there were various equally valid mathematically ways of expressing the same DNA statistic, took the view that the way in which the equation was expressed could produce unfairness. He illustrated the risk of unfairness of presenting alternative propositions of different levels of persuasiveness

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<sup>36</sup> At [50]. See also [72].

by using a random occurrence ratio of 1 in 1000, and taking the population of Australia as 21 million:

1. 1 in 1000 people would be expected to have the DNA profile found in the hair specimen.
2. 999 out of 1000 people would not be expected to have the DNA profile found in the hair specimen
3. 0.1% of people would be expected to have the DNA profile found in the hair specimen.
4. 99.9% of people in Australia would not be expected to have the DNA profile found in the hair specimen.
5. 21,000 people in Australia would be expected to have the DNA profile found in the hair specimen.
6. 20,979,000 people in Australia would not be expected to have the DNA profile found in the hair specimen.

The problem, as Justice McClellan saw it, was percentages could give the impression that there is no possibility other than there is a proper match. Or, to put it another way, by necessary inference there is no possibility other than that the accused is the source of the crime scene stain.

In *Aytugrul* the figures were modest but we are used when dealing with nuclear DNA to figures in the billions. Importantly, Justice McClellan recognised that his reasoning was just as applicable when odds such as 1 in a billion were presented:

*“Jurors may incorrectly assimilate a low likelihood ratio with a 0.0% chance that the crime scene DNA came from anyone but the accused. “*

Justice McClellan<sup>37</sup> cites a number of publications by JJ Koehler, which examine the persuasive power of differing methods of presenting statistics to a court. Koehler's conclusion is that when statistics are framed in the language of probability that is, percentages, they appear more persuasive than if framed in the language of frequencies, for example, one in a thousand. It is easier to imagine percentages and thus they become more probable, and, as they come closer and closer to zero, more compelling. Frequencies on the other hand allow for other alternatives.

The Chief Judge concluded at [103]:

*However, in my view, it will continue to be a matter for the trial judge to assess whether the probative value of a likelihood ratio outweighs its prejudicial effect. Where exceptionally low odds are presented to the jury (such as 1 in 10 billion), a similar problem may occur to that which occurs in the use of high exclusion percentages. Jurors may incorrectly assimilate a low likelihood ratio with a 0.0% chance that the crime scene DNA came from anyone but the accused. That is not an example of the Prosecutor's Fallacy, because it involves an assimilation of two statistics rather than the incorrect use of one, but it comes close.*

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<sup>37</sup> At [89] –[95].

Why is this so? It is apparent from what I've outlined above that I agree with Justice McClellan that there are dangers associated with juries and judges overestimating the power of DNA matches when the accompanying statistics are expressed in percentage terms that come close to 100%. The chance of conflating such match statistics with proof of guilt is too great to risk.

Just as problematic are cases where the likelihood ratio or match probability is expressed in terms of 1 to one billion or greater. When only two possibilities are presented to a jury: that the DNA originated from the accused or that it occurred by chance, the natural, or common sense, assumption (given such high figures) can lead to the conclusion the accused left the crime scene sample and by necessary inference that he or she committed the crime.

Likelihood Ratios can be calculated directly by an expert but are increasingly determined by standard generic programmes on an excel spreadsheet. Some experts and Laboratories, by convention, do not report figures above 1 in 10 billion, greater than the estimated population of the earth. There is room for a rule or convention that limits such evidence so that it gives fair and realistic, but not excessive figures, about or descriptions of the relative rarity of the profile.

There is merit in adopting what occurred at trial in *Forbes*, the expression of relative rarity in support of DNA profile matches by a form of words such as "weak" "strong" "very strong" or "extremely strong". And, also, for the automatic inclusion in any report of the foundational assumptions behind any calculation of rarity.

Two things expose the problem with statistics in the billions. Justice Vincent noted the first: depending on which programme is used you get a different figure. The second is: we are not random individuals; most of us have close relative who if not otherwise excluded, could possibly have contributed to a crime scene sample and statistically are much more likely to have the same profile.

There is also room for a convention that touches on something rarely reported but always relevant: the rarity of the profile when other factors such as the possibility of a relative or person of similar racial type left the profile are taken into account.

A high match probability or likelihood ratio carries with it an implication that no one else has the same profile and that another match cannot exist. But statistical probability is couched in generality. A high probability match can tell us what to expect but cannot predict the next outcome. The circumstances that led to one person's genetic code may happen again by chance.

A survey of DNA databases by the National Institute of Forensic Science examined 33,858 profiles, and found 206 matching pairs!<sup>38</sup> This was significantly more than the statistical model predicted.<sup>39</sup> Matching pairs can be explained as twins, brothers or duplicates, because offenders use aliases or because of genuine coincidence. Only by investigating each match can the real reason be known. To date the investigation needed to explain the matches has not been done.

DNA evidence has little force without some expert assessment of the rarity of the profile said the “match” the crime scene sample. How then is fairness achieved?

One solution is to allow the parties to present the evidence as they see fit and leave it to the jury. Long experience has taught us that to do so is fraught with danger. It is accepted that warnings are required in relation to some certain types of admissible evidence. The best examples are those set out in the *Evidence Acts* - visual identification (s.116) and unreliable evidence (s.162). I believe a warning is required in every case where issue is taken with the DNA evidence is presented to a court.

A problem with having a statute based requirement for a warning is that DNA is generally much more accurate than visual identification evidence. Similarly, it could by no means fall into the category of potentially unreliable evidence. That said, there remains a justifiable fear, based on sound research and reasoning, that jurors and judges may give DNA evidence too great a prominence and transpose the statistics relating to match probability as the probability the accused left the crime scene stain.

## **CONCLUSION**

DNA match evidence is often critical to the modern criminal trial. Both prosecution and defence should have access to the latest techniques and technology. DNA evidence can prejudice an accused but there is nothing intrinsically unfair in its use. It provides one of the best methods of assisting the prosecution establish the identity of an offender. A profile match of itself however is not proof of identity. Where DNA is the only evidence the risk of a miscarriage is so great that no conviction should be allowed to be based on that evidence alone and no the trial should proceed without something for the DNA evidence to corroborate.

The sensitivity of DNA testing brings with it consequent dangers from contamination, including undiscovered secondary transfer of DNA, and the misapplication of the available

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<sup>38</sup> At each of the nine markers used on the Profiler Plus system.

<sup>39</sup> S Walsh and J Buckleton, *Report on Duplicate Detection* accompanying; J Buckleton, S Walsh and R Mitchell, “Autosomal microsatellite diversity within the indigenous Australian sub-population”, 2004, National Institute of Forensic Science, Melbourne. New Zealand reviews of their database have also turned up an unusual number of matches. See J Buckleton, S Walsh and C Trigg, *Forensic DNA Evidence Interpretation*, 2005, CRC Press, Boca Raton, FL, USA, p 463.

technology. The potential probative force of statistics, given in support of a DNA profile match, means great care must always be taken as to how the DNA evidence is given and how a jury is directed to use such evidence.

If there is a real and substantial risk that the way in which evidence is expressed can result in unfairness then different ways of explaining the true import of the evidence and giving a jury a correct understanding about the relative rarity of the profile can be found. Those explanations can and should be accompanied by evidence noting the problems associated with any statistical assessment. The qualifications and assumptions must be explained and accompanied by appropriate warnings. This was done in Mr Forbes' case where there was some other evidence as to opportunity once the jury rejected the alibi evidence. He appealed, as was his right, but in his case there was a proper explanation of the DNA evidence. There the statistics were qualified and expressed in terms which, as far as I can see, properly reflected the force of the evidence. As presented, they did not invite the jury to say the percentages were as close to zero as to mean certainty.

Mr Aytugrul however had the rarity of his profile match put in a way, which carried the real risk the DNA profile match would be used unfairly. It was unnecessary to express the evidence this way. With the greatest respect to those who held otherwise the other evidence pointing to guilt was not of itself sufficient to overcome my unease that a miscarriage of justice may have occurred.

Andrew Haesler

4 February 2011