

DNA: A TRIAL LAWYER'S PERSPECTIVE

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Introduction

1. There is little evidence more reliable or persuasive than good circumstantial evidence....
2. But there is little evidence that can be so persuasively misleading as bad circumstantial evidence.

(McGarvie 1993)

It is this conflict which underlines the problem with DNA.

Identification by comparison of certain locii in different DNA samples is mooted by the forensic scientist as a method not just of detection but also of proof, but can it be reconciled with the competing interests of our system of justice which is very jealous of the right to a fair trial?

The criminal trial is directed to determining the guilt or innocence of an accused. That question of fact is to be decided by the jury.

It is decided however within time honoured guidelines, namely that the Crown must prove its case beyond reasonable doubt.

The criminal trial has evolved slowly and cautiously but always with that safeguard.

It was best expressed by Blackstone :

"it is better that 9 guilty men go free than one innocent man be condemned."

It is an amplification of this concept of reasonable doubt that gives rise to the principle, particularly in circumstantial cases, that an adverse inference can only be drawn against an accused person if it is the only reasonable inference open *Plomp v R.* [1963] 110 CLR 234 at 252.

This is relevant because often the jury is asked to draw an inference from DNA evidence in order to be satisfied beyond reasonable doubt that it was the accused who committed the act or acts that constitute the crime. In that sense we are often dealing with a "primary" or "intermediate fact depending on whether you are reading *Chamberlain* or *Shepherd*. (*Chamberlain v The Queen* [No 2] (1984) 153 CLR 521.) (*Shepherd v The Queen* (1990) 170 CLR 521).

It is against that jurisprudential background that the following questions have to be considered:

1. What is the probative value of DNA evidence?

In simple terms the Crown seeks to place before the jury comparisons from different samples of DNA usually from the offender and the suspect. It looks at several locii on these samples to see if they match. It requires a decision as to whether they match, whether they are inconclusive or whether they exclude the suspect. This decision is not absolute or even objective. It depends on the setting of certain standards the deciding of certain cut-off points.

It then requires a way of interpreting that match so that it has some meaning for the jury from which they may draw inferences. It does this by setting out the probability of those alleles matching by chance between the offender and a person chosen at random in the community.

It is not a fingerprint. This evidence cannot identify the suspect as the person who left the sperm or blood or human hair.

How fair this is in terms of the accused's right to a fair trial depends on an appraisal of various shortcomings relating to reliability, accuracy and acceptance within the scientific community.

2. What are some of the shortcomings?

Its novelty. This is a very recent area of science. It has effectively only been around since 1985. However whilst its basis is sound the procedures for DNA typing are still developing.

"There is no scientific dispute about the general validity of the general principles underlying DNA typing."

However,

"..a given DNA typing method might or might not be scientifically appropriate for forensic use ... it must be rigorously characterized in both research and forensic settings to determine the circumstances under which it will and will not yield reliable results" (US National Research Council 1992 2-2).

As a novel scientific technique the Crown must be able to show that it has a sufficient scientific basis. The techniques must not only be past the experimental stages they must be past the scientifically accepted stage. It must be settled in the scientific community.

This means that there has been a written settled protocol. It means that the protocol has been published so that it has been exposed to peer criticism. If it is not ready for the scientific community it is not ready for the courts.

The reliability of the laboratory

The Crown will seek to ask juries to be satisfied of the laboratory finding beyond reasonable doubt. It will ask them to accept the sometimes subjective views of scientists. The court is entitled to have regard:

- (i) to the history of the laboratory. Documentation should be made available of the conduct of internal blind and open proficiency testing. This is not currently being done.
- (ii) to whether the laboratory is accredited. It is said that the accreditation process is very long and involved. One would expect that accreditation would precede admissibility.

The existence of a satisfactory match criterion

"an objective and quantitative rule for deciding whether two samples match."

(USNRC Manuscript 1992 2.2.1.3)

This is frequently a contentious area. One would expect that the match criterion is well settled and the subject of written protocol and again subjected to peer scrutiny by publication.

In fact it varies from laboratory to laboratory depending on different variation experienced.

"The match criterion must be based on the actual variability in measurements observed in appropriate test experiments conducted in each testing laboratory. The criterion must be objective, precise, and uniformly applied. If two samples lie outside the matching rule, they must be declared to be either inconclusive or a non-match"

(USNRC Manuscript 1992).

This was the subject of the submission in a case recently in Melbourne. In that case the match criteria was set on the basis of what had been shown to be the experimental error variation between female blood and female epithelial cells from vaginal swabs. It was subsequently used as the error factor between DNA from sperm and blood. It was argued that as the sperm was much harder and more protected than the epithelial cells it was inappropriate to use this as a standard where the DNA came from sperm. By doing so it widened the net of matches when they might have been inconclusive. Whilst it might be a convenient way of approaching it from the experimental scientist's point of view it also meant increasing the chance of an innocent man being convicted. Although a ruling has not formally been delivered the DNA evidence was excluded.

Gremlins

The presence of unexplained phenomena in autorads such as extra bands, faint bands, frowns, smiles, thick bands and the curse of them all band shift are very common. The visual reading of autorads already fraught with the subjectivity of the reader, seem to be plagued by irregularities. This in turn leads to explanations and rationalisations which are often theoretical and at the very least controversial. These were problems in the *Castro* case and in *Tran* there were disputes between experts about faint bands which the judge held would have been impossible for the jury to resolve .

It would seem that there should be clear, identifiable, and demonstrable reasons to explain anomalies and where explanations depend on rationalisations or hypothesis the evidence ought not be admitted.

The calculation of probabilities

(a) Its importance.

The DNA typing method is an enabling procedure. Its worth lies in its statistical conclusions.

"The jury has no basis on which it can evaluate the evidence. There is no way the jury can properly evaluate the value of such evidence (DNA analysis) if there is no evidence before it as to the frequency of the match within the general population"

(Hampel J. in *R. v. Lucas* [1992] 2 V.R. 109)

In the American case of *Barney and Howard* 92 Daily Journal D.A.R. 10924 at page 10931

"The statistical calculation step is the pivotal element of DNA analysis, for the evidence means nothing without a determination of the statistical significance of a match of DNA patterns."

(b) Its weakness.

The method employed to determine the frequency of the match within the community is to multiply the frequencies of the individual alleles. It follows a standard population genetics equation called the "Hardie-Weinberg" equation. This depends on the assumption that each matching allele is presumed to be statistically independent. The forensic scientist is able to multiply from a relatively limited database to an astronomical figure like 1 in 1 billion. This question is within the area of expertise of the population geneticist. There is however a fundamental dispute amongst population geneticists about the legitimacy of this procedure.

Richard Lewontin from Harvard and Daniel Hartl of Washington University lead a group who say that the "product rule" is misleading and unjustifiable. They say that the principle is based on incorrect assumptions. In particular they questioned the application of the Hardie-Weinberg rule and said that the assumptions ignored population sub-groups.

Similarly Chakroborty and Kidd lead the counter attack insisting that their approximations are close enough.

It is widely accepted that this dispute exists in this particular part of the scientific community. It was the subject of decision in *Barney and Howard* in America and acknowledged to be unresolved by the American NRC report (1992).

In England in the case of *Hammond* (New Scientist, 6 March 1993) a lower court judge accepted criticism of the product rule because there were

"..two respectable bodies of opinion at loggerheads in the scientific world."

(c) The area of dispute is in population genetics.

The matter is further complicated by the fact that the application of the statistical analysis depends upon principles which have their foundations in population genetics. If there were no population genetics you could not make any probability theory at all.

The witnesses giving evidence for the Crown are usually forensic scientists with an expertise in molecular biology. Whilst they may give opinion evidence within their area of expertise and they may rely on the published opinions of those with similar expertise (*P. Q v Australian Red Cross Society* [1992] 1 V.R 19, 34-36) it is by no means certain that this extends to selecting the most convenient argument when it is an area of recognised dispute outside their expertise.

The target population.

Questions arise where the offender is known to be of a certain ethnic origin or where he is likely to come from a particular sub-group, or where the suspect is of a particular racial

sub-group. How can the forensic scientist make predictions where there is no data base for that sub-group?

In *Tran* 50 A. Crim. R. 233 the absence of a database for Vietnamese was seen as a problem by the trial judge.

Bias

This is a significant shortcoming because it can be subconscious and difficult to deal with.

"The moral wrongfulness of giving evidence which is not the product of a careful and objective mind is more obvious with direct evidence than with opinion evidence. If a witness did not see the accused near the scene of the crime before it happened the moral wrong is saying that the accused was seen is patent. With opinion evidence, particularly where questions of degree are concerned the evil of giving the opinion without ensuring that it is as reliable as possible is not so apparent" (McGarvie J. op cit).

The starting point here is the fact that there is a commercial interest in the organisations that market the various procedures. They have a vested interest in the success of their methods. It also means that there is difficulty in examining the procedures and exposing them to public and scientific scrutiny. In Lucas for example the procedures were only made available with appropriate undertakings from counsel that the details would not be disclosed.

The question is not helped by the fact that the attitudes of the various protagonists has been heated and in some cases acrimonious.

This has been particularly true of the history of litigation in the United States commencing with the *Castro* case where the voir dire took some considerable time.

More recently reports of the population statistics debate were characterised as "bitter", "raging" and resulting in tempers being flared .

In *Tran* in NSW the judge referred to

"the voir dire on the validity of these findings was bitterly contested"
 . (at p. 236).

Certainly the dispute reaches personal levels. Witnesses get characterised as prosecution or defence witnesses. Perhaps the adversarial system does not help this. Whatever the reason it would seem that the polarisation of the witnesses does not help the accused get the fair trial that Hampel J. seems to envisage when he quotes Maurice J. in *Lewis* [1987] 29 A.Crim. R. 267:

"For my part I think that whenever the Crown wishes to rely upon forensic evidence the prosecutor has a clear duty, not just to his client, the Crown, but to the trial judge and the jury to acquaint them, in ordinary language, through the evidence he leads, with those aspects of the experts' discipline and methods necessary to put them in a position to make some sort of evaluation of the opinion he expresses. Where the evidence is of a comparatively novel kind, the duty resting on the Crown is even higher: it should demonstrate its scientific reliability. It is not an answer to considerations that dictate these things be done to say the defence may draw

it out in cross examination, that is an abdication of the Crown's primary function in a criminal prosecution" (at p.117).

Degree of difficulty

The capacity of the tribunals of law and fact to deal with these questions is a problem. We are living in times where law reform is directed towards streamlining and expediting the criminal procedures. Voir dres are not exactly the flavour of the month with shorter trial committees. In Victoria section 464 of the Crimes Act was specifically brought in to avoid consistently lengthy voir dres in relation to confessional material. The admissibility of DNA evidence has the potential for getting out of hand. Because of its complicated nature and interfacing of different sciences the parties can produce experts in molecular biology, statistics and population genetics. Clearly judges and barristers find the arguments difficult to grapple with. This problem is exacerbated when we come to the juries themselves.

Whilst we should not underestimate the jury system courts have already recognised that the average jury is going to find it difficult to make responsible decisions on these questions.

In *Tran* at page 242 McInerney J. expressed reservations in that case about putting before a jury, matters of difficult dispute between experts, on the basis that they were not really in a position to determine them:

"Whilst I do not wish to be critical of anyone, as I know these matters are very difficult, I believe that because of the views about the presence or otherwise of the upper faint band, and the criticism of the scientific testing, that to put this evidence before the jury, in my view, would have a tendency to produce a misleading and confusing impression for the jury."

In *Lucas* similarly, Hampel J. had trouble seeing how a jury could resolve differences of opinion in these areas:

"Experts can and often do have legitimate differences of opinion particularly with respect to new procedures and techniques. These are normally matters of weight not admissibility, although in this case I find it difficult to see how a jury could resolve these different views and if it was able to resolve the differences meaningful to any conclusion about the reliability of the tests and about the significance of the results" (p. 113).

How can a jury decide what the scientist cannot settle?

Perhaps the most difficult area to counter about this evidence is the public perception of DNA evidence. It is perceived as being absolute. It can have an effect on a trial that is out of all proportion to its real probative value. Once it is let in it will be accepted as overwhelming.

Lewis at 271:

"Forensic evidence, especially if it goes to a vital issue implicating an accused person in the commission of an offence, may often have a prejudicial effect in the minds of the jury which far outweighs its probative value. The jury, being people without scientific training, may often be impressed by an expert's qualifications, appointments and experience and the confident manner in which he expresses his opinion. And yet it ought not

be left to such matters alone to provide a foundation for the making an assessment of the probative value of forensic evidence, particularly where there are conflicts in expert testimony, or where it is acknowledged that other experts of more or less equal distinction are unlikely to agree."

It was suggested in *Baller* (1975) 519 Fed 2d 463 at 464 that

"Unless an exaggerated popular opinion of the accuracy of a particular technique makes its use prejudicial or likely to mislead the jury, it is better to admit relevant scientific evidence in the same manner as other expert testimony and allow its weight to be attacked by cross examination and refutation..."

Again Hampel J. took the view in *Lucas* at p. 118

"...DNA testing is widely regarded as extremely reliable and discriminating. Its limitations and particularly limits as to the conclusions which can be drawn from the tests are not generally appreciated."

The Law so far

A great number of these issues have been allowed into evidence unchallenged. There have also been a number of cases where the evidence has been partially challenged.

In America (*Barney and Howard*) and England (*Hammond*) there are instances where it has been held that it ought not be led because of the fundamental dispute between the population geneticists. Equally, there have been courts that have admitted it as a question for the jury.

In Victoria a judge has ruled that evidence of probabilities arising from the application of the multiplication rule is admissible. On the question that the dispute among population geneticists is too fundamental, it was held to be a matter for jury determination.

The judge ruled out evidence of PCR testing in that case. This was excluded without considering the validity of submissions. This was on the basis that the jury would have sufficient to engage its attention in following the VNTR system, and understanding disputes about the validity of the multiplication rule, without having to come to grips with yet another DNA procedure.

On the question of the matching criteria there has been a recent refusal to allow that in evidence in the Victorian County Court. It was held that in a case where there was a head-on conflict between experts the jury could not properly evaluate the material.

Whether those cases depend on their facts or not, there are clearly issues of wider significance which have yet to be tested in the appellate jurisdictions.

There could be a threshold question as to reliability. This could relate to the methods and the conclusions. Are they sufficiently accepted within the scientific community?

It is arguable that the *Frye* test (namely whether the technique has gained sufficient acceptance in the field to which it belongs) is either the law to be applied in Australia or alternatively it sets out a very important criteria to be considered in admitting evidence of this kind. In the Queensland case *R. v. Raymond Carroll*, [1985] 19 A Crim R 267 the Court of Criminal Appeal held that the fact that the experts were a long way from

unanimity was an important factor in overturning a jury decision. Kneipp J used the Frye test in this without actually acknowledging its source. In *R. v. Lewis*, Maurice J. had no doubts as to the origin of the principle at page 269:

"One can extract from Carroll a principle similar if not identical to that laid down in that famous lie detector case *Frye v The United States* (293 F 1013)"

He then quoted the following passage :

" just when a scientific principle crosses the line between experimental and demonstrable stage is difficult to define. Somewhere in this twilight zone the evidential forces of the principle must be recognised, and while the courts will go a long way in admitting expert testimony deduced from a well recognised scientific principle or discovery, the things from which the deduction is made must be sufficiently established to have gained sufficient general acceptance in the field in which it belongs."

Whilst it is clear that the science of DNA is soundly based the procedures are clearly the subject of scientific controversy.

On one view it might not matter whether the *Frye* test applies or not. There is a preliminary question as to the probative value of the evidence. If the disputes are fundamental how can a jury resolve them?

This brings us back to the question of what it is that the Crown will be trying to prove. The Crown more often than not will be seeking to lead it as a piece of circumstantial evidence. It will usually be directed to identifying the accused as the perpetrator of the crime. Such a step will be an essential link in proving an element of the offence. The standard of proof required for such an important conclusion will be proof beyond reasonable doubt. If it is not capable of being used by a jury to that end it arguably ought not be placed before them. It can only have prejudicial not probative value.

But the question remains can it be led, not as being capable of proof beyond reasonable doubt, but simply a piece of circumstantial evidence which when viewed with all the other evidence in the case leads to being satisfied beyond reasonable doubt of guilt for example, the fact that the procedures that are available to exclude the accused do not do so and when you put that with evidence of opportunity, proximity and motive the Crown case becomes strong enough. Perhaps that is where this evidence really lies. It is relevant because it does not exclude the accused, but it is premature, to put it before juries as the difference between guilt and innocence.

Whilst the protagonists may be happy for the evidence to be used in this way the fact is, that once it is placed before a jury it is unlikely to be limited as a piece of minor circumstantial evidence. The media and public perception precludes this qualified use.

We are left therefore with the potential of misleading circumstantial evidence. If we return to our priorities in our system of justice, in particular the need for a fair trial for the accused ,can we afford to prematurely admit this evidence?

SELECTIVE BIBLIOGRAPHY AND TABLE OF CASES

Chakraborty and "The Utility of DNA Typing in Forensic Kidd Work" ;
 Lewontin and Hartl, 1991, "Population Genetics in Forensic DNA Typing"
 McGarvie R.E 1993, "Circumstantial Evidence and Justice Today"
 Roberts L. 1991 , "Fight Erupts over DNA Fingerprinting" Science
 U.S. National Research Council 1992,
 "DNA Technology in Forensic Science"

Plomp v. R. [1963] 110 C.L.R. 234

Chamberlain v. The Queen (No. 2) [1984] 153 C.L.R. 521

Shepherd v. The Queen [1990] 170 C.L.R. 521

R.v. Lucas [1992] 2 V.R. 109

R. v. Van Hung Tran [1990] 50 A. Crim. R. 233

People v. Barney / People v. Howard 92 Daily Journal D.A.R. 10924

R. v. Lewis [1987] 29 A. Crim. R. 267

Baller [1975] 519 Fed. 2d 463

R. v. Raymond Caroll [1985] 19 A. Crim. R. 267

Castro 545 N.Y.S. 2d 985 Supp. 1989