

# VICTORIA POLICE FORENSIC SERVICES DEPARTMENT

## ELEMENTS OF FORENSIC MEDICINE

### DNA PROFILING

#### **Issues in the Courts**

There are two categories of issue which have been raised in recent court cases where DNA evidence has been sought to be introduced: legislation providing for compulsory acquisition of samples; and the admissibility of DNA profiling evidence.

#### **1. LEGISLATION**

Recently enacted amendments to legislation have incorporated several checks and balances to prevent infringement of civil liberties. The rationale for the legislative changes, however, also involves the nature of much of Forensic Biology work, which consists of making comparisons. The identification and typing (including blood typing and DNA profiling) of biological material cannot identify the perpetrator of a crime. However, it is possible to include or exclude suspects by comparing the results with reference samples (e.g. blood, hair, mouth swabs) from individuals who are possible sources of the material in question.

Section 464 of the Crimes Act (1958) has been amended several times. The Crimes (Blood Samples) Act 1989 came into force on 1/6/90 for 1 year initially. This was the first amendment that permitted the taking of a blood sample for the purposes of obtaining a DNA profile from a suspect or accused person. A Magistrate may make such an order if stringent conditions are met, including that the taking of the sample “would tend” to confirm or disprove his or her involvement in the crime. This requirement was found by a Magistrate not to be satisfied in one case where it was not certain that a result would be obtained from the crime scene material. The Magistrate said that “would” meant “will”, which was the same as “must”.

The Crimes Legislation (Miscellaneous Amendments) Act 1991 and the Crimes (Amendment) Act (1993) further amended Section 464 of the Crimes Act.

However, a blood sample obtained under Section 464 of the Act was found to be inadmissible in an incest case (County Court, 1995) because the alleged offences occurred in New South Wales. In another incest case (County Court, 1996) there was confusion over what offences Section 464 applied to. Furthermore, the Court ruled that Section 464 did not apply where a child was conceived as a result of a sexual assault because a paternal allele in the child did not constitute material from the body of the

offender left at the scene of the alleged crime. This anomaly was rectified in a provision of the Crimes Amendment (Forensic Procedures) Act (1997).

This Act was proclaimed on 1/7/1998. It specifically allowed samples from convicted persons to be included in a database for intelligence purposes. Because the previous amendment did not specifically state that samples could be retained for such purposes, all samples taken prior to 1/7/1998 were destroyed (unless they were required for on-going legal proceedings).

The amendment also provided for samples to be obtained from persons previously convicted for certain specified offences and in prison on 1/7/1998. Application to take samples from such persons must be made in open court. Failure to comply with this provision has been used as grounds to order that samples and records taken must be destroyed.

The Victoria Forensic Science Centre monitors progress in analysis of forensic samples from suspects to ensure that provisions of Section 464 of the Crimes Act are complied with in relation to time limits and destruction of samples. The Centre relies on information provided by the Police when the person is not charged, is acquitted, or successfully appeals, or when no application is made to retain the sample following conviction. In these cases the Centre is required to destroy the sample and the DNA profile.

## **2. ADMISSIBILITY**

DNA technology has now been largely accepted by the Courts. There is a movement towards accreditation of all forensic science laboratories. The reliability of their results is maintained by Quality Management programs, which include:

- validation studies
- quality control procedures
- proficiency testing
- internal and external audits

Defendants have rarely contested DNA evidence, and in several cases, have pleaded guilty after inculpatory DNA evidence was presented at committal proceedings.

Challenges to the admissibility of DNA evidence have focussed on the weight of the evidence:

- how reliable is the technology used to establish whether two profiles match?
- what is the likelihood of obtaining a match if another person is the source of the DNA?

## **Overseas experience**

In the United States of America, some states apply the Kelly-Frye rule, while other states use a relevancy standard which new technology must satisfy.

In an early judicial decision on the admissibility of DNA evidence (*People of the State of New York v. Joseph Castro*, Supreme Court, Bronx, NY, 1989), Judge Sheindlin accepted that the theory and practice of DNA identification were generally accepted, but added a third “prong” to the Frye standard when he ruled that the evidence of a match was not admissible in this case owing to several major failings in the procedures used by the commercial laboratory which performed the tests.

In the Federal Courts (*United States v. Yee*, N.D. Ohio 1990), in an unsuccessful attempt to have a conviction set aside, the FBI’s method of calculating frequencies was challenged, mainly along the lines that the use of a broadly based population data may not give a reliable estimate of the probability of a chance match in certain population sub-groups. The court found that the general scientific community accepts the FBI’s procedures and protocols.

In 1993 the United States Supreme Court decided (*Daubert v. Merrell Dow Pharmaceuticals*) that the Frye standard is no longer applicable in federal courts. Trial courts should consider several factors, including: whether the scientific techniques can be tested; peer review and publication; potential rate of error; existence and maintenance of standards; and whether the scientific theory or methods have attracted widespread acceptance within the relevant scientific community.

In 1989, the Technical Working Group on DNA Analysis Methods (TWGDAM) in the USA published rigorous quality assurance guidelines, which were updated in 1993 and 1995, and which were adopted by the American Society of Crime Laboratory Directors - Laboratory Accreditation Board (ASCLD-LAB) as the standard for laboratory accreditation in the USA and Australia. The Victoria Forensic Science Centre gained ASCLD-LAB accreditation in 1994. The TWGDAM Guidelines formed the basis of the NATA standard for DNA laboratory accreditation in Australia.

In 1990, the US Congress Office of Technology Assessment (OTA) examined DNA typing methods and reported that these were valid and reliable if properly performed. In 1990, the National Academy of Sciences of the USA initiated a study by the National Research Council (NRC) of DNA typing methods, and its report, issued in April 1992, recommended, among other things:

- that current DNA typing procedures are fundamentally sound;
- that each laboratory should have a detailed quality assurance program in place;
- that laboratories have proper accreditation; and

- that a national DNA profile data bank be established, especially of convicted sex offenders, and of unidentified samples from crime scenes.

On the issue of statistics, however, the NRC had great difficulty coming to an agreed position. They concluded that the assumption of independence between alleles is valid when calculating the probability of a chance match, but recommended a method called the “ceiling principle” to ensure that conservative population frequencies are used. In order to allow for the possibility that population substructure might lead to underestimation of the likelihood of DNA profiles matching by chance, the report called for the establishing of databases of DNA profiles from many different ethnic groups. Each allele in a DNA profile should be compared with all of these databases, and the highest value for its frequency should be used. This procedure did not gain scientific acceptance in the forensic and academic communities, and the NRC has conceded that “some of the statements in the 1992 report have been misinterpreted or misapplied in the courts”. A new committee was formed to re-examine the statistical and population genetics issues relating to DNA evidence. In its second report, the NRC (1996) abandoned the ceiling principle and proposed instead the use of a more scientific (though by no means universally accepted) procedure to allow for possible inbreeding in some populations. The NRC made what most regard as a mistaken recommendation for evaluating the result of a match obtained through a database search.

### **Australian experience**

DNA was first used in a Victorian criminal investigation in July 1988, and became available as a routine test in July 1989. At about the same time, Genetic Technologies Corporation, a Sydney company, also began providing a DNA profiling service. DNA evidence was first introduced in a criminal trial in the County Court of Victoria in October, 1989 (Queen versus Bulling).

There were two important rulings on the admissibility of DNA evidence in the NSW Supreme Court in 1990.

In the Queen v. Lindsay Douglas Elliott (Armidale, NSW, April, 1990), Justice Hunt conducted a *voir dire* on the reliability of Genetic Technologies’ testing procedures, and ruled that the DNA typing results were admissible.

In the Queen v. Van Hung Tran (Supreme Court of NSW, October, 1990), Justice McInerney ruled that DNA typing results provided by Cellmark, a UK company, were inadmissible, owing to doubts about the existence of certain bands in the profile which Cellmark said matched the accused. There was evidence that the actual offender was Vietnamese, and therefore it was argued that the court should be provided with an estimate of the likelihood of a chance match among the Vietnamese population of Sydney. Cellmark did not have a Vietnamese database, but provided estimates for the Caucasian, Afro-Caribbean and Indian-Pakistani populations of the UK.

Other NSW courts, as well as the Supreme Courts of Western Australia (Queen v. Kelly and Joseph, 1990; Buckland, 1995; Lukacevic, 1996), Tasmania (Hyland, 1994), Queensland (Soper, 1992; upheld by the Court of Appeal), South Australia (Jarrett, 1994; Karger, 2001) and the Northern Territory (Morley, 1995; Staats, 1997), have tested and accepted DNA evidence.

In the Supreme Court of Victoria (Queen v. Ronald Victor Lucas, May 1991), a *voir dire* was conducted before Justice Hampel. The prosecution eventually withdrew calculations of the statistical weight of the DNA evidence. Justice Hampel then ruled that the evidence was inadmissible because it was more prejudicial than probative without these calculations.

In the murder trial of Juric in 1998 in the Victorian Supreme Court, DNA profiling results for the loci D1S80 and HLA-DQA1 results were found to be admissible. Statistics were given for the match probability at these two loci, and additional results for the Profiler Plus system were presented without statistics. Juric was found guilty on 16 September, 1998. Juric appealed, and the Court of Appeal (29 May, 2002) found that the trial judge had erred in admitting evidence of the Profiler Plus match without any statistical weighting, because this evidence was prejudicial to the defendant, in that the jury would have no means of assessing the weight that should be attached to it. Juric was acquitted after a retrial in 2003.

Results of DNA profiling have been challenged and accepted in numerous admissibility hearings, but have been admitted in evidence without challenge in a majority of criminal trials in Victoria. In the Queen v. Vivona (County Court, Geelong, 1994), Judge Nixon allowed the forensic scientist to give evidence of a match and to quote a population frequency for one DNA locus, but did not allow frequencies for several loci to be multiplied together. This ruling was later upheld by the Court of Criminal Appeal.

In the Queen v. Mayne, Airey and Noll (Supreme Court, 1994) the multiplication of match probabilities across genetic loci was again challenged. However, the Court accepted that the results of preliminary statistical tests failed to show significant correlations between the DNA loci, and allowed the multiplication of probabilities for the DNA loci, but excluded the results of a protein-based typing (Gc) from the calculation. The use of statistics was again challenged in the County Court in Morwell (Queen versus Fossati, 1996). Judge Duckette ruled that evidence of such routine statistical calculations may be given by a forensic biologist, and accepted his opinion that all of the loci were statistically independent.

In the case of Banushi (1995), experts for neither side were prepared to rely on a very weak band which apparently matched the accused. They disagreed, however, on what effect this had on the remaining evidence of a match. The Crown proposed to present the evidence of a match, with the doubtful result reported as inconclusive. The defence claimed that

"inconclusive" was not a valid term, and therefore the whole of the DNA evidence should be reported as a mismatch. The prosecution was able to show that the defence expert himself had used the same term in comparable circumstances. The judge agreed with the Crown's argument.

In another case (*R. versus Percerep*, 1992), Judge Stott commented that what is perceived as prejudicial to the defence may be probative to the prosecution. Judge Stott also found that a jury would be able to understand and evaluate the evidence, and would not have to speculate or guess. He rejected a submission by the defence counsel that a jury would ignore any limitations or limits to the conclusions made from the tests.

Similarly, Justice Mullighan (*R. versus Jarrett*, Supreme Court of South Australia, 1994) did not accept that evidence, if relevant, should not be admitted just because it is challenged, and the jury might not understand it. Justice Mullighan found that disagreement among experts is not sufficient reason to withhold evidence from a jury. Similar rulings were made in other cases (*R. versus Airey, Mayne and Noll*, Supreme Court of Victoria, 1994; *R. versus Atkinson*, County Court of Victoria, 1994).

However, Judge Villeneuve-Smith (*R. versus Stevenson*) ruled that the ability of a jury to understand the statistical evidence was one factor which led him to rule that the DNA evidence could not be presented to the jury. In evidence critical of the DNA database used by the expert called by the Crown, a defence expert confessed that he was confused, a sentiment with which the judge concurred.

More recently, three further issues have been raised in Australian Courts. One concerns the reliability of DNA profiling as applied to very small quantities of DNA. In theory, if the number of copies of a genetic marker (locus) is very small (less than ten), the DNA typing system (PCR process) may fail to amplify and detect one of a pair of characteristics (alleles) that an individual possesses at that locus. This failure could give rise to an incorrect typing result and thus a false mis-match (false exclusion of a suspect who was actually the source of the crime scene sample). Forensic science laboratories are well aware of this possibility, and interpret results from very small samples with caution. In two Victorian cases (*Prendergast*, County Court 1998; *Briggs*, Childrens' Court, 1999), however, it was claimed that such an error could produce a false match (a very much less likely event, because it presupposes that two individuals have DNA profiles that differ only by the absence, in the suspect, of the DNA characteristic that the DNA typing system failed to detect, in material from the actual, unknown offender). In each case, the DNA evidence was found to be inadmissible.

A second concern was the failure of the manufacturer of DNA typing kits in use worldwide, to publish important details of its validation studies. This issue has been the cause of DNA being excluded from several US Courts (*State of Vermont v. Pfenning*, 2000; *Schreck*, Colorado Supreme Court). A NSW Supreme Court trial (*R. v. Gallagher*,

2001) was halted because of the same issue. These courts held that this failure by the manufacturer violated the requirements of laboratory accreditation. The ruling in Schreck was overturned on appeal in 2001. Similar challenges to the admissibility of DNA evidence were dismissed in the NSW Supreme Court (R. v. McIntyre, 2001) and the South Australian Supreme Court (R. v. Karger, 2001).

A third issue in several recent Victorian trials was the presentation, by an expert, of evidence of the result of DNA testing when the expert had not done the testing himself nor supervised it. Counsel for the defendant argued that the expert's opinion rested on hearsay evidence. The trial judge ruled that the opinion was nevertheless admissible. However, the Court of Appeal (R v Ryan [2002] VSCA 176 (1 November 2002) held that there was no evidentiary basis to support the opinion, and quashed the conviction. A consequence of this finding is that an expert may not give an opinion based on the work of other staff of the laboratory without the consent of the defence. In cases where counsel for the defence wishes to cross-examine the scientists who actually performed the testing, some or all of those scientists must give evidence of the fact of having done so.