DNA: its Place in the Criminal Justice System

Tracy Alexander BA(Hons), MSc, Cold Case Review Manager, LGC HQ, Room A018, Teddington, Email: Tracy.Alexander@lgcforensics.com

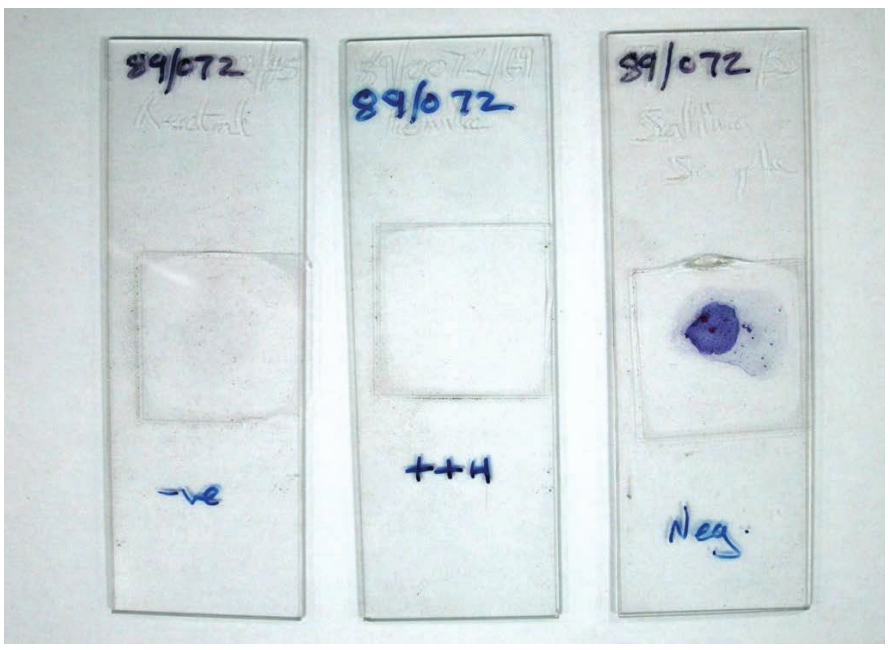
The final part of this series* looks at how the use of DNA profiling has contributed to the Criminal Justice system, but also at the changes that use has brought about.

DNA evidence has become a fundamental part of the presentation of evidence in criminal trials, though it has its place in other scenarios.

Historically, evidence of identity was limited to that of a direct eye witness, with all the inherent pitfalls that created. With the coming of photography came the possibility of capturing and keeping an image, and the development of fingerprint identification further enhanced the possibility of a criminal being identified from the traces he or she left behind. The Fingerprint Bureau was set up in the UK in 1901, with the first conviction employing this technology being for a murder in 1905.

The first paper reporting the use of DNA in a criminal context was published in 1985 by Alec Jeffreys, Professor of Genetics at Leicester University. Jeffreys was researching inherited variation in human DNA and he demonstrated how a DNA profile could be used to resolve issues of identity and kinship. Its initial use in legislative practice was to demonstrate that a child was the legal offspring of two individuals already granted asylum in the UK, and therefore entitled to remain.

The first use of DNA in a criminal investigation came in the following year, when Professor Jeffreys contributed to the solving both of a murder and of a 'cold case'. In 1983 Lynda Mann had been found raped and murdered on a deserted footpath in Leicestershire. Conventional grouping tests on semen samples from the body suggested that her killer was a person with blood type A and an enzyme type shared by approximately 10% of males in the general population. With no further evidence the case remained unsolved. In 1986 the murder of another girl, also in Leicestershire, was linked by police through modus operandi. Police held a prime suspect, Richard Buckland, who confessed to the second murder but not the first. Jeffreys, in conjunction with the Forensic Science Service, using extraction methods which enabled DNA from semen to be separated from DNA from vaginal cells, demonstrated that the murders were committed by the same person and that that person was not Buckland. Leicestershire Constabulary and the FSS began an investigation in which 5,000 local men were asked to volunteer blood or saliva samples, but after six months no matches had been found. Later one of those men was heard bragging that he had been paid £200 to give a sample on behalf of a man called Colin Pitchfork. Pitchfork was arrested in September 1987 and samples taken from him matched those of the double killer. Pitchfork admitted the murders and was convicted in 1988, becoming the first man to be convicted on DNA evidence, with Buckland being the first person to be proved innocent by DNA profiling. It was also the first time that the mass DNA screening of a population had been undertaken, a process that has been carried out on numerous occasions since. Even in cases where no suspect has been identified through this process it has been beneficial in quickly eliminating a large number of individuals from the investigation.



Slides "sperm heads can still be visualised on old slides with an AP+ reaction" Credit: CathyTurner

Legislation

In the UK, a Royal Commission was set up in 1993 to look at the opportunities that new DNA technologies might be able to offer the criminal justice system. The ability to copy and therefore multiply samples meant that regions of DNA could be replicated simultaneously, but the possibilities of this new technology were limited by restrictions in the Police and Criminal Evidence Act. PACE1984 had been specific about the consent and authority required before a sample could be taken. Samples were categorised as 'intimate' or 'non-intimate' and regulations covered who could and could not take samples. The Criminal Justice and Public Order Act 1994 redefined intimate and non-intimate samples: mouth swabs were redefined as non-intimate and could be obtained without consent. Though a suspect could refuse to open his mouth, it was then permissible to pluck head hairs with roots from which DNA could be obtained. Consent was still required to obtain blood and still required a qualified practitioner to take it. The Police Reform Act (2002) changed the regulations concerning the taking of samples: a police constable could now take non-intimate samples, or could delegate this power to a 'designated person' such as a civilian forensic officer. It also created the requirement for all new police officers to supply DNA samples to the Police Elimination Database.

In 1995, the evolution of technology and the subsequent change in legislation meant that the Home Office was in a position to create a database. The technology was simplified and automated, and the world's first criminal intelligence database was launched in April of that year: the UK National Criminal Intelligence DNA Database (NDNAD). Scotland and Northern Ireland have databases separate to that in England and Wales.

In the UK, legislation regarding the collection, storage and use of data held on the NDNAD has developed over time, and no single piece of legislation covers every aspect Legislative amendments have been made to old laws, and case law originating from judges' rulings has re-defined the application of the legislation.

The Doheny and Adams ruling (1997) addressed the way in which DNA evidence should be presented in court. An expert could no longer give an opinion on whether a crimestain came from a suspect, but had to explain its probability. In 2000, the Lashley judgement in the Appeal Court ruled that DNA evidence alone was insufficient to bring a conviction and supporting evidence was also required. However, this can be as limited as geographical proximity to the offence; living in or having visited the region where a crime scene stain is matched can be enough. Furthermore, in 2000, challenges to convictions in two cases, R v Wier (murder) and R v 'D' (rape), sparked further reform. PACE (1984) required samples to be destroyed after acquittal or discontinuance; Wier and 'D' were identified using unlawfully held DNA samples.

The convictions were appealed, but the Lords found that it would have been against the cause of justice for the convictions to be set aside, and the Criminal Justice and Police Act 2001 amended PACE so that now all DNA data collected from persons arrested for an offence could be kept, whether found guilty or not guilty. The Criminal Justice Act (CJA) 2003 further extended this so that data could be logged from anyone arrested for an offence, irrespective of whether they were eventually charged.

Within a short space of time the database doubled in size, but the problem of holding records of innocent people was created. Samples and profiles could only be destroyed by application to the Chief Constable of the arresting force. In addition, the holding of samples for the prevention or detection of crime is exempt from the Human Tissue Act (2004), brought about in part as a response to the discovery of the retention of the organs of children without consent by the Alder Hey Children's Hospital.

Examination of footprints Credit: Andrew Brooks

Recent legislative changes will have a tangible impact on DNA identifications. The Nuffield Council on Bioethics published a report in September 2007 on "The forensic use of bioinformation: ethical issues" which recommended that proposals to extend police powers even further to include the taking of DNA for minor offences such as littering should not be implemented. In addition there has been a growing perception amongst civil liberties groups that the retention of samples on the NDNAD of individuals who were never convicted of an offence infringed the civil liberties of those whose DNA profiles were stored. The Appeals of 'S' and Marper particularly apply: both were arrested in 2001 in separate incidents, but both cases were dropped. On application to the Chief Constable of South Yorkshire, both were refused the right to have their samples destroyed. Between 2002 & 2004 they were refused a judicial review of the decision, and their appeal was rejected first by the Court of Appeal and then by the House of Lords. However, in 2008 the European Court of Human Rights found in their favour, stating that the indefinite retention of profiles on a database interferes with a right to a private life, and is particularly important for minors. Following consultation, this led to further amendments to PACE (1984) being promoted in the Crime and Security Act 2010 which passed into law, but which has not been enacted to date. The coalition government elected in 2010 has further revised provisions for the rights of the individual in the Protection of Freedoms Act 2012, with far-reaching consequences for the NDNAD. The terms of the Act require that approximately one million records of people on the database in England and Wales, and the copies held elsewhere, must be removed. The law does not require the removal of records of adults who have been convicted or have accepted a caution from the police, and people arrested for (but not convicted of) a serious offence can have their records retained for three years in the first instance, or a further two if there is the approval of a court (www.genewatch.org/sub-539488).

To date it has been possible to carry out a Familial Search on the UK NDNAD. On arrest, two buccal swabs are routinely taken, one to be kept as a back-up in case the first sample fails to yield a profile. The 'A' sample is processed; the remaining 'B' sample is stored. When a crime scene sample has not given an immediate match on the database it has been possible to look for previously loaded profiles that show similarities. Geographical factors and known information about the suspect, such as age, are taken into account to narrow the number of near matches. Once a manageable number of matches are obtained, it is possible to profile the 'B' sample looking only at Y-STRs (DNA information obtained only from the Y chromosome and so only paternally inherited). This information allows the formulation of family trees indicating the presence of a male relative who fits the criteria for the offender but who has never been arrested for a recordable offence. The first successful prosecution relying on this procedure was in 2004 when Craig Harman was convicted of manslaughter for throwing a brick from a bridge which killed a lorry driver. Harman had left his blood on the brick (having injured his hand before taking it), but did not at that point have a police record. Forensic experts at the FSS found a profile with similar characteristics using the new techniques of familial searching through a relative whose profile was on the database, and as a result, the police traced Harman. Familial searching has always been limited to the most serious of cases and requires approval from the DNA ACPO lead. However, the application of familial searching in this way will no longer be available to police forces as following the Protection of Freedoms Act 2012 the UK has decided to destroy all 'B' samples (over six million samples), even if taken from convicted offenders.

Some rights of the suspect have been set aside when arrested or detained under certain sections of the Terrorism Act 2000, and specific rights apply to suspects under the age of majority i.e. 18 (www.legislation.gov.uk).

Checking DNA database for possible matches. Credit: Andrew Brookes

It is interesting to note that the Association of Chief Police Officers (ACPO) recently announced, before the actual implementation of the Protection of Freedoms Act 2012, a new operation to capture the DNA of individuals whose profiles are not currently held on the database. Using powers under the Crime and Security Act 2010, which became law last year, the aim of Operation "Nutmeg" is to gather DNA profiles from criminals who were convicted before 1995 (when the database was launched). Initially the operation will target 11,993 criminals convicted of serious offences such as murder, manslaughter and rape over the past 40 years. The success of the initiative is impossible to guess but there is obviously scope for further sampling, plus potential implications for the removal or retention of the samples currently targeted for destruction.

Persistence of DNA and Use in Historic Cases

Trace amounts of DNA can be recovered from bones as much as 5,500 years old, with opportunities within the forensic world for the identification of the victims and perpetrators of crime. In 1992 DNA testing gave compelling evidence linking remains recovered in Brazil in 1985 with Nazi war criminal Dr Joseph Mengele who died in 1979 by comparing a sample taken from the femur of the skeleton with samples taken from his widow and his son, which indicated full parental inclusion. In 1991, skeletal remains found in a shallow grave in Yekaterinburg were identified by Russian authorities as those of Tsar Nicholas II, the Tsarina Alexandra with three of their children. Remains discovered in a nearby smaller grave in 2007 were identified as the remaining two children using mitochondrial DNA, in part using samples from the Duke of Edinburgh who shares the same maternal link. Improvements in technology have meant that DNA is a frequently employed technique in resolving "cold cases", such as in the recent conviction in the UK of David Burgess for the murder of Yolande Waddington in 1966.

Thus the profiling of DNA and the use of those profiles in criminal investigation and prosecution, whilst not being the cure-all suggested by modern media, is a valuable tool in maintaining the safety of the population of the UK.

**Article 1*

DNA Technology: 150 years or Research and Development, by Tracy Alexander. ILM January 2014, Vol 39, Issue 1

Article 2

DNA: Collection and Interpretation, by Tracy Alexander, ILM March 2014, Vol 39 Issue 2

Tracy Alexander BA(Hons), MSc, Cold Case Review Manager, LGC HQ, Room A018, Teddington, Email: Tracy.Alexander@lgcforensics.com