DNA evidence and police investigations: a health warning.

Jason Roach and Ken Pease

Introduction

Much has been made of recent advances in DNA science and technology with particular emphasis placed on its bewildering implications for policing and the detection of serious offenders. Operation Phoenix for example, conducted by Northumbria Police in conjunction with the Forensic Science Service (FSS), has seen a total of 42 named DNA matches obtained against the National DNA Database (NDNAD) for more than 400 unsolved sexual offences over a 14 year period, resulting in 14 convictions up to 2005 (Forensic Science Service Annual Report 2004-05). Both technical advances in DNA serology and the infrastructure of analysis and retention bring forensic DNA analysis into the mainstream of detection, with accompanying public interest. For example the development of Low Copy Number techniques (LCN) now render very small samples usable. The size of the National DNA Database (well over three million by early 2006) aspires to cover the active criminal population.

The use of DNA evidence in police investigations stems, as is well known, from the work of Sir Alec Jeffreys and colleagues at Leicester University (see Jeffreys Wilson and Thein 1985), whose generation of images from RFLP[1] analysis of unique human DNA were so redolent of supermarket bar codes as to be irresistible to the public mind. Because some twenty years has now elapsed since the first use of the Jeffreys technique it may be worthwhile rehearsing what happened, since it illustrates the central argument of this paper, that the linkages between DNA identification of offenders and the detection task generally is, and must be, subtle in order to optimise detection efficiency. The danger which the writers sense is of a free-standing and formulaic application of DNA identification techniques.

In 1983, Lynda Mann, aged fifteen, was raped and murdered at Narborough. A semen sample was taken from her body. Three years later, Dawn Ashworth, also fifteen, was found strangled and sexually assaulted in the same area. Semen samples were also recovered from Dawn's body. The prime suspect was a seventeen-year-old kitchen porter who confessed to killing Dawn. Alec Jeffreys was called in and revealed that the semen from the two bodies was from the

[1] Restriction Fragment Length Polymorphism.

same man – but that man was not the confessing kitchen porter, Leicestershire police then decided to undertake the world's first DNA mass screening. No profiles matched the profile of the killer. A year later a woman told police that she had overheard her colleague, Ian Kelly, bragging that he had given his sample whilst masquerading as his friend, Colin Pitchfork. Pitchfork, a local baker, had persuaded Kelly to take the test for him. Pitchfork was arrested and his DNA profile found to match with the semen from both murders. He was sentenced to life imprisonment for the two murders in 1988. [2]

The point of this article is not to detract in any way from the achievement of the FSS and of pioneering DNA work, nor is it to question the exciting possibilities that it holds for policing, with regards to the detection and conviction of serious offenders. On the contrary, the sight of officers knocking on front doors and arresting rapists seventeen years after their offence, is as staggeringly impressive as it is welcome – a kind of 'Minority Report' in reverse[3]. Although success is well deserved, it is also well documented elsewhere and as such does not constitute the focus for discussion. Instead, this article suggests that the identification and apprehension of offenders must continue to be seen as a consequence of the wider investigative process. Seeing the successful apprehension and conviction of serious criminals as merely a matter of 'the appliance of science' matching DNA samples carries with it huge dangers, both in the neglect of other detection approaches and in the failure to develop different and more subtle uses of the available technology. The integration of DNA evidence with the detection enterprise is the aim. This is likely to, as will be noted later, lead to DNA analysis progressing in directions different from those that might be assumed.

A mild DNA evidence health warning is now offered which centres upon three specific considerations in turn. DNA evidence

- is not all about identifying offenders
- can make convictions more difficult
- should be regarded as a tool which complements, not replaces, the skills of the detective.

[2] http://www.bbc.co.uk/crime/caseclosed/colinpitchfork.shtml

[3] The science fiction crime film directed by Spielberg and starring Tom Cruise, where future crimes are foretold by the premonitions of three 'pre-cognitive' beings. Police arrive at the crime scene to arrest the offender as they are about to commit the offence.

DNA science is not all about identifying offenders

A common public misperception of the use of DNA science propagated by the media is that its sole utility lies in catching criminals. In such a scenario, the function of forensic service providers would be reduced to merely identifying and helping to 'put away villains'. This is explicitly rejected in the FSS mission statement:

'Our mission is to support crime detection, the conviction of offenders, and the exoneration of the innocent, it reflects our position as an impartial provider within the Criminal Justice System and the Community, where our services are as available to the defence as they are to the prosecution'. (FSS Annual Report and Accounts 2004-05).

One cannot rest all the blame for this misconception at the door of the media. In the FSS Annual Report and Accounts (cited above) all the case studies detail how the FSS has played its part in the successful conviction of individuals previously undetected by conventional means. No mention is made of the 'exoneration of the innocent' and yet DNA science has made a significant contribution in this area. The same is found in the National DNA Database Annual Report 2003-04 where from half a dozen illustrative examples none represent 'exonerations'[4]. Examples are however felt appropriate here.

During the 1983 Pitchfork inquiry (as discussed) the prime suspect was kitchen porter Ian Buckler who confessed to the second murder but denied the first. Advances in DNA science were able to exonerate Buckler and elevate him to the first person ever to be exonerated by DNA fingerprinting

In 2003 Welshman Jeffrey Gafoor was freed after being convicted of murder in 1988. A case review of the evidence found that DNA preserved from the crime scene was a closer match to Gafoor's nephew instead so exonerating Gafoor. The case is believed to be the first where an innocent, yet related individual was used to identify the actual criminal via 'familal searching'.[5]

In Chicago, in 1989, Gary Dobson became the first person to have his conviction overturned as a result of DNA evidence. As of 2005 a total of 164 people in the US have been freed due to post-conviction DNA testing. [5]

[4] http://www.forensic.gov.uk/forensic_t/inside about/docs/NDNAD_A-3-4.pdf
[5] http://en.wikipedia.org/wiki/Genetic_fingerprinting#Fake_DNA_evidence

DNA evidence performs additional functions such as identifying victims of crime or natural disaster. In the case of the notorious Canadian serial killer Robert Pickton, DNA science was used primarily to prove and identify the existence of his victims - in excess of 20 female prostitutes buried around his farm. [5]

In 1992 DNA evidence was used to identify the body of Nazis Dr. Josef Mengeles' in a Brazilian grave, when previously he had been buried under a pseudonym. The same process has been used to identify further 'war criminals'.[5]

The point made is that the application of DNA evidence to crime extends much further than the popular media misconception that it is limited to identifying offenders. The FSS and DNA evidence are far from 'one-trick ponies'.

Supplying a wider context for thinking about DNA use will seem unnecessary to service providers (we know what else we do) and to the informed public, but it is necessary, both to release the imagination, and to allow the science to be seen as even-handed as between prosecution and defence, and having wider utility which is unquestionably benign.

DNA evidence can make convictions more difficult

Away from the Olympian heights of even-handed science and back in the grubby world of the courtroom, it has been our observation DNA evidence can make a conviction more difficult because of more informed defence tactics. Before the advent of DNA evidence suspected burglars (for example), denied ever having been at the alleged location. If evidence were subsequently offered which persuasively placed them there the jury would probably be of the opinion that if the accused was lying about that then he was probably also lying in claiming innocence.

DNA evidence has in many cases led defence lawyers to recognise the futility of clients denying their presence at the crime scene. Three tactics remain plausible depending upon circumstance. First, those accused of being at a crime scene may admit that they were there. Second, those whose DNA is found on portable objects such as cigarette stubs may claim that the objects were moved from elsewhere. Third, DNA not being date-stamped, the offender can claim he was at a location with permission but at another time

DNA evidence is made available to both defence and prosecution. In 1991, the defence for Allan Legere, the first Canadian convicted of murder as a result of DNA evidence, claimed that the relatively shallow gene pool of the region could have led to a 'false positive'.[6] Arguably, the most famous case of the defence using the production of DNA evidence to advantage was in the O.J. Simpson trial. Simpson's defence managed to convince the jury that DNA evidence had been 'mishandled' by police. This contributed to his acquittal despite the seemingly overwhelming evidence against him (although of course a subsequent civil case found him responsible for the death of his wife and her friend).In the Simpson trial, (referred to in some media as the DNA wars) such doubts as were raised focused on the handling of samples and the integrity of law enforcement personnel rather than the DNA itself. It was alleged that smudges on the packaging of one blood sample indicated the packaging took place when the blood was wet, at a time when it should have been dry, that samples had been contaminated or degraded. Each of these was admitted as theoretically possible by prosecution experts, but not realistically possible in the Simpson case.

The precautions currently taken in the UK in handling DNA samples are stringent, and (famous last words) it is difficult to see how a similar challenge to the evidence might succeed. Indeed it may not have succeeded in the Simpson case had not alleged racism amongst the investigators invited the thought that the DNA evidence had been manipulated.

In 1992, in Canada, DNA evidence was also called into question in the case of Dr. John Schneeberger[7] He raped a sedated patient, leaving semen on her underwear. Police used his blood on three separate occasions to extract DNA and failed to get a match. On realising his mistake Schneeberger had cunningly surgically inserted a 'Penrose drain' filled with foreign blood and anticoagulants in order to fool the police. He was eventually convicted because of police persistence and numerous additional blood extractions.

The examples set out above, which could be multiplied, indicate how DNA evidence might be called into question. An important distinction should be made here. The serology is rock solid. Human beings are uniquely identifiable by DNA samples which they deposit at crime scenes. The wriggle room for defendants lies elsewhere: in claims that samples were planted by their enemies or by police, that any sexual contact did not constitute a crime, and that the

[6] http://en.wikipedia.org/wiki/Genetic_fingerprinting#Fake_DNA_evidence
[7] http://en.wikipedia.org/wiki/Genetic_fingerprinting#Fake_DNA_evidence

accused was at the crime scene but not at the time of the crime. There are also real technical limitations on DNA technique, which will be mentioned briefly later.

DNA is, and will remain, a powerful evidence sources, but in some senses a diminishing one as perpetrators become more astute in avoiding or disposing of DNA trace evidence, and providing scenarios which render the DNA evidence less incriminating. DNA evidence often helps to strengthen a case but it must only be seen as a facet of the wider police investigation and the prosecution case which is the subject to which we turn.

DNA science should be seen as a tool which enhances, not replaces, the skills of the detective.

Police Investigations catch criminals

We have written nothing so far of which the informed police officer is unaware, and the reader may be becoming impatient. The reason for writing something on the topic is that detection in the popular and political imagination is coming to be increasing dominated by discussions of forensic science, with possible future consequences for resourcing and training emphases. 'Criminal trapped by DNA', is a popular newspaper headline of recent years, conjuring up images of a men and women in white coats in laboratories solving particularly nasty crimes, instead of women and men in blue uniforms, in cars with flashing lights. Such stories seemingly cement an idea, at least with the public, that traditional detective work is no longer the most effective method of apprehending serious offenders – no need for Sherlock Holmes, DNA is all you need. Add to this the recent arrest of John Humble as the Yorkshire Ripper hoaxer – unmasked after 25 years as the infamous 'Wearside Jack' by recent DNA science advances - and one can be forgiven for forming the impression that science has now rendered conventional detection obsolete.

Modern crime fiction treats the police detective little better with forensic scientists using DNA science to single-handedly solve complex cases - often with the result of relegating police to the role of performing an arrest (e.g. 'Silent Witness' from the BBC). The seemingly peripheral role of the police is exemplified in the film 'Minority Report', where the police are blatantly relegated to the physical apprehension of the offender, rather than solving the crime – this is done by mutants with premonitions! Pre-cognitive science has done the difficult part in identifying serious criminals before they have

committed the crime[8]. Meanwhile back in the real world, we are dealing with crimes which have happened, but the analogy is there nevertheless.

Although the view that modern day police detective work is all about the science of DNA may indeed be a worst case scenario painted here, the danger is that effort is deflected from conscientious detection of the conventional kind. We must not let the science overshadow the detection process as a whole. In no way should its importance as an investigative and evidence gathering tool be underestimated, neither should it be seen to take the credit for single-handedly solving crimes. The appropriate balance needs to be struck. The Pitchfork case stands as a famous example.

DNA evidence: some limitations

In addition to the wriggle room offered to defendants in the face of DNA evidence there are some real technical limitations. For example DNA matching is possible:

- Where the DNA is treated and used properly. A DNA sample is destroyed when a profile is extracted, so if not done properly there is unlikely to be any second chance (although half the sample is kept for the defence).

- If the offender has a prior recorded offence for which DNA samples were taken. DNA science may help attribute a series of offences to the same individual (e.g. a serial rapist) but if the offender has no previous record than no match will be forthcoming. At present the database archives the DNA of several million offenders, therefore, it is often more effective at identifying known 'prolific' offenders than it is a 'one-off' occasional, or someone about to become prolific. We worry greatly about Strategic Objective 2 of the National DNA Database Board which is to obtain DNA profiles from the active criminal population. A moment's thought reveals that to be impossible given the distributions of lengths of criminal careers, many being short enough that, with current levels of detection, they will be over before the police are in a position to take a criminal justice sample (see Leary and Pease 2003). This kind of self-delusion from such a prestigious body is an instance of what concerns us about the over-selling of DNA identification. Where

[8] The Twentieth Century Fox and Dreamworks film (2002) based on a short-story by Philip K Dick

DNA obtained from a crime scene is not linked to an identifiable offender but is stored in hope that the same individual offends in the future. If said offender does not get caught for any further offences no match can be made and the offender remains unidentifiable. In the case of Wearside Jack, DNA evidence from Humble extracted when he was arrested for drunk and disorderly behaviour, was matched to saliva found on the seal of the envelopes sent from the notorious 'Ripper hoaxer'. Had he not committed a second offence – much later – his identity would still be a mystery.

- Where an offender resides near the location of their offence as in the Pitchfork case, else local police DNA sweeps prove fruitless. The authors have recently conducted a review of several cases where the perpetrator has been identified recently via DNA evidence years after the offence, with the aim of ascertaining why these individuals were not apprehended at the time. In two cases DNA sweeps had been conducted but the offenders had left the area (contact authors for more information).

- Where an offender is not forensically aware. Some criminal profilers (e.g. Canter 2003) have maintained that when an offender leaves behind fingerprints or DNA it is a sign that they are forensically naïve because they have not been through the system. By implication, those offenders who 'hide their tracks' are old hands, aware of the capabilities and processes of forensic science (e.g. scenes of crime officers SOCO). However, some have recently called for television crime dramas to stop giving the secrets of forensic science away in programmes such as 'Waking the Dead' and 'Silent Witness') on the grounds that it is making offenders too forensically aware, posing both a challenge to police and profilers alike.

A health warning

The above examples, although no means exhaustive do emphasise a necessity for police to continue with more traditional aspects of the investigation process such as establishing motive, modus operandi and witnesses, but also for the media to reflect this, and training and resources distributed accordingly.

The health warning should also cover not only the limitations of DNA evidence but also to redirect attention to its many other uses, such as

identification of bodies in natural disasters. Let's use these wonderful scientific advancements as they become available to us to catch criminals, but let us remember that they are additional tools in the police armoury not replacement ones. As one serving officer said to us recently, if you want to locate a suspect at a scene use mobile phone networks to help you as they are often more reliable than DNA. The media obviously do not find the title, 'Mobile phone traps criminal' as appealing.

Jason Roach, University of Huddersfield (j.roach@hud.ac.uk)
Ken Pease, University of Loughbrough (k.pease@lboro.ac.uk).

References

Canter. D (2003) – *Mapping Murder: Walking in Killers' Footsteps*. London.Virgin Publications.

Forensic Science Service Annual Report 2004-05 - http://www.forensic.gov.uk/forensic_t/inside/about/docs/04_05.pdf (Accessed on 3/5/2006)

Jeffreys, A.J.., Wilson V. and Thein S.I. (1985). Individual specific 'fingerprints of human DNA. *Nature*, 316, 76-79.

Leary R. and Pease, K. (2003) DNA and the Active Criminal Population Crime Prevention and Community Safety: An International Journal. 5 (1), 7-12.

Minority Report - Twentieth Century Fox and Dream Academy Films (2002) Screenplay by Scott Frank based on a short-story by Philip K Dick.

http://en.wikipedia.org/wiki/Genetic_fingerprinting#Fake_DNA_evidence (Accessed on 7/5/2006)