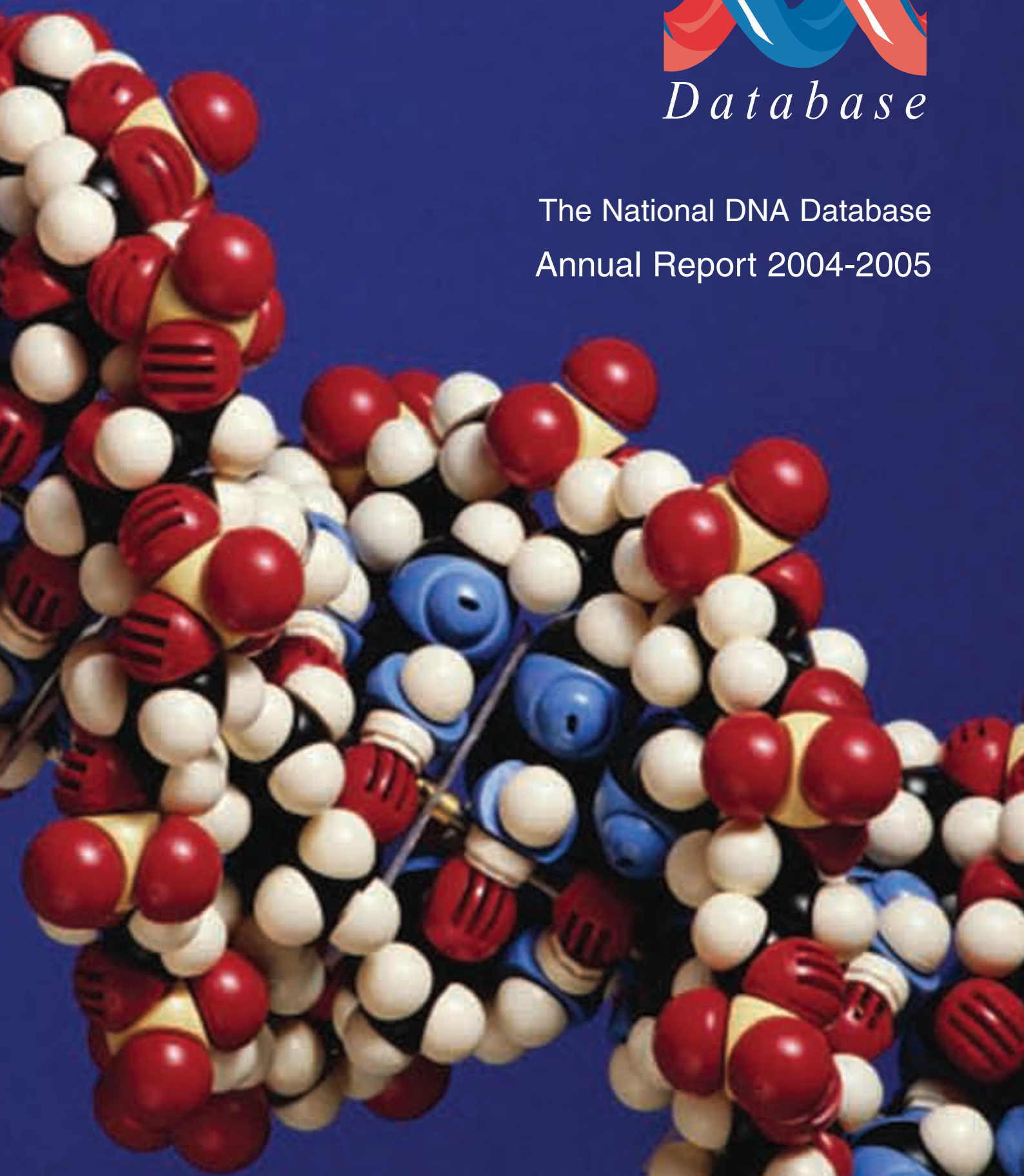


NATIONAL[®]
DNA
Database

The National DNA Database
Annual Report 2004-2005



The National DNA Database Board

Chairman

Mr David Coleman

Chief Constable, Derbyshire Constabulary (until December 2004)

Mr Tony Lake

Chief Constable, Lincolnshire Constabulary

Members

Dr Steve Bain

Human Genetics Commission

Dr Bob Bramley

Custodian The National DNA Database

Mr Ian Gordon

Deputy Chief Constable, Tayside Constabulary
Lead on DNA for ACPO (Scotland)

Mr Stuart Hyde

Assistant Chief Constable (Crime)
West Midlands Police

Dr David Werrett

Chief Executive
The Forensic Science Service

Mr Tim Wilson

Head of Home Office Science Policy Unit

Secretariat

Mr David Moore

Detective Chief Inspector
Derbyshire Constabulary (until December 2004)

Ms Katrina Morton

Detective Inspector
Lincolnshire Constabulary

Strategic Objectives

1. To establish independent oversight of The National DNA Database

- Provide for independent oversight with lay input
- Separate the Custodianship of The National DNA Database from the FSS
- Establish a coherent management group for The National DNA Database
- Provide an even-handed service to all police forces and supplier laboratories

2. To obtain DNA profiles from the active criminal population

- Publicise the value of The National DNA Database
- Secure support from the Home Office for the police and The National DNA Database working in partnership with Government
- Maximise sampling opportunities
- Ensure retention of DNA profiles in line with current legislation and policies

3. To maintain public confidence in the security and integrity of The National DNA Database and its use

- Ensure compliance with all relevant legislation
- Establish arrangements for obtaining independent advice on ethical matters
- Protect the DNA samples and information on The National DNA Database from unauthorised access and use
- Improve the systems for minimising and rectifying erroneous information on The National DNA Database
- Formulate and communicate our strategy and plans
- Subject ourselves to scrutiny and audit
- Provide for public access to appropriate information

4. To improve the use and effectiveness of The National DNA Database

- Increase police awareness of the benefits and cost-effectiveness of DNA in the prevention and detection of crime
- Provide comprehensive management information on police, supplier laboratory and Database performance
- Pursue improvements to improve the speed of delivery and scope of Database services
- Encourage opportunities to derive more intelligence information from The National DNA Database
- Capitalise on the potential synergy between the DNA and other intelligence databases

5. To develop use of The National DNA Database in partnership with other agencies in the Criminal Justice System

- Build long term partnerships with the key players (ACPO, police forces, Home Office, PITO)
- Improve the services we provide through joining up our systems with those of our CJS partners
- Establish facilities for the identification of missing persons and victims of mass disasters

6. To enhance the position of The National DNA Database as the world-leading DNA Database

- Maintain up to date knowledge of DNA and databasing technology
- Participate fully in international developments in the use of DNA databases
- Influence development of cross-national standards and protocols
- Provide a full contribution to an international service

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Chairman's foreword

Rarely a week goes by without some of the most serious crimes being solved through use of the Database. Operation Advance, which concentrates on reviewing unsolved serious crime, has regularly achieved outstanding successes, some of the cases going back many years. We should never underestimate the importance to victims, witnesses and their families of being able to detect these crimes, even after all this time.

The contribution of DNA science to reducing the levels of burglary and car crime has also been significant and has undoubtedly been an important factor in the reduction of these areas of volume crime in successive years.

The advances in science and technology continue to move at an incredible pace and it is important to acknowledge the enormous contribution made in this essential area of police work by the forensic science providers in both the public sector and the commercial world. Without their help, enthusiasm and co-operation we would not have made the progress achieved so far. In particular, the improvements they have made in speed of analysis and turn around of sample submissions has made a significant contribution in detecting and apprehending suspects for crime at an earlier stage, thus preventing further offending and reducing the number of victims of crime.

The police service, however, is a demanding customer, and the Association of Chief Police Officers' Forensic Science Committee has a clear strategic aim to see forensic science services delivered in a way which speeds up still further the analysis times for DNA and provides even better value for money. The National DNA Database Board recognises the real prospect of DNA analysis equipment becoming smaller, more automated and easier to locate and use outside the forensic science laboratory. In this respect, it was very exciting to see the Forensic Science Service (FSS) develop a prototype of a mobile laboratory capable of carrying out DNA analysis at the scenes of serious crime. This "Lab in a Van" approach will help provide investigators with valuable forensic evidence immediately, and hence improve further the chances of the offender being identified quickly and prevented from offending again.

The reduction in the size of DNA analysis equipment will almost certainly also provide an opportunity to enhance the role of custody centres throughout the UK. In combination with Livescan and future developments in biometric technology it will enhance our ability

to establish the identity of suspects beyond doubt whilst they are within the custody environment and improve the potential for identifying offenders responsible for other outstanding crimes as quickly as possible, before they are released from a police station. This should greatly enhance the detection of crime and also prevent further offences being committed. The potential benefit for the country as a whole in terms of reducing crime and reducing the number of potential victims will be a step change in the way we manage the custody environment.

The National DNA Database Board is not complacent about the success achieved so far. We value the reputation the United Kingdom has in developing DNA technology and the Database itself and fully recognise how essential it is that we protect that reputation. This involves establishing the highest professional standards of performance within the forensic supplier environment and ensuring compliance with these standards. In this context the work of the Custodian and the supporting team remains fundamental to success. I should like to pay a special tribute to Dr Bob Bramley, the Custodian, and his team of dedicated staff, who do so much to keep the Database itself running so efficiently and effectively.

The National DNA Database Board is accountable for how the Database is used and for improving the way it works. In overseeing the operation of the Database, the Board has continued to benefit over the last year from the advice and views of the representative nominated by the Human Genetics Commission (HGC), Dr Steve Bain.

Following the recommendations of the McFarland Review (July 2003), work has started on progressing the separation of the Custodian activity from the Forensic Science Service, as it becomes a Government-owned company, and moving towards a new Strategy Board to oversee the operation of the Database. The Strategy Board will have tripartite governance arrangements involving the Association of Chief Police Officers (ACPO), the Home Office, and the Association of Police Authorities (APA). There will also be non-executive members, and it is likely that the HGC nominations will be increased to two, allowing them to have greater input to policy decisions being made by the tripartite board. It is essential that the public continue to have confidence in The National DNA Database.



"It is a privilege and a pleasure to introduce this, the third annual report of The National DNA Database Board. In April 2005 we celebrated the 10th anniversary of the foundation of the Database itself, the first of its kind in the world, which is fast approaching having three million stored individual profiles."

The United Kingdom is a world leader in the application of DNA evidence in criminal investigations and we have the largest DNA database in the world. We also have the most enabling legislation, with successive changes in the law since the inception of the Database, including the Criminal Justice and Police Act 2001 and the Criminal Justice Act of 2003, all contributing to the increase of profiles on the Database.

We look forward to continuing to develop The National DNA Database and there must be opportunities in the future to consider working in a more collaborative way with other law enforcement agencies and within an international forum that will place an even greater emphasis on detecting serious and organised international crime.

Other opportunities for maximising the use of the Database will involve helping to establish the identities of people who are the victims of mass disasters. There is

also the potential for helping to identify missing persons.

Finally I should also like to add my thanks to David Coleman, Chief Constable of Derbyshire Constabulary and former chairman of The National DNA Database Board. There is little doubt that under his stewardship and with the leadership that he provided, the effectiveness of the Database has improved enormously.

Tony Lake
Chief Constable
Lincolnshire Constabulary
Chairman, National DNA Database Board

Tony Lake joined the Metropolitan Police in 1972 and spent much of his early service working in Central London.

Most of his career has been engaged in operational roles. He won a Bramshill Scholarship in 1985 and went to Corpus Christi College, Cambridge, where he read History obtaining BA (Hons). In 1992 he transferred to West Yorkshire Police where he worked as Divisional Commander in South Bradford,

introducing community policing to an area of considerable diversity. In April 2000 he took up the post of Deputy Chief Constable, British Transport Police. He continued to contribute to the work of ACPO and was Chairman of the ACPO Property Tracking Group and represented ACPO (UK) in work which is developing a European Standard in vehicle tracking. On 24 September 2003 he was appointed Chief Constable of

Lincolnshire Police and at the beginning of December 2004 he assumed responsibility for the ACPO Forensic Portfolio and became Chair of the Forensic Science Committee and The National DNA Database Board.

The first Database match was for burglary and theft from a furniture store in Chesterfield, Derbyshire, which took place in April 1995. A swab was gained from a stain on the floor of the premises and a profile obtained which matched a 20-year-old man. He was subsequently sentenced to a three-month term in a young offenders' institute.



The National DNA Database Board



Kerry Curtis

Kerry Curtis completed a full career with the Ministry of Defence before undertaking a period of overseas service providing administration and logistic expertise to assist emerging governments with elections and post election administration. For several years he worked closely with the Government Food Chemists department dealing with International Food Standards and Procurement. He has been an Independent Member of the Avon and Somerset Police Authority for seven years, and holds a committee chair's appointment with the National Association of Police Authorities. He welcomes the opportunity and the challenge of representing the APA and the wider public through the tripartite governance of The National DNA Database Strategy Board.



Tim Wilson

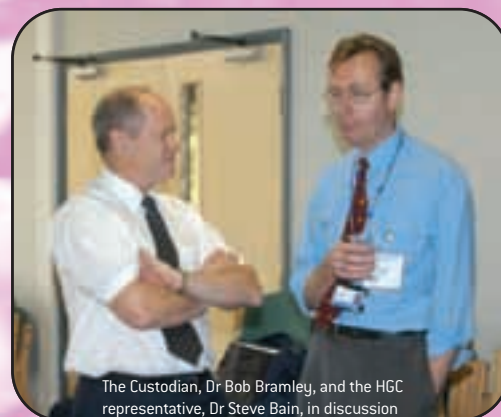
Tim Wilson has worked in a wide range of Home Office Units, chiefly concerned with penal administration, and managed a £200 million per annum capital investment programme. Most recently he specialised in PFI/PPP work in the Home Office, as Head of the Private Finance Policy Team at HM Treasury and on secondment to WS Atkins Investments, a private sector company. He has advised the National Audit Office and the Northern Ireland Executive, as well as the South African and Dutch Governments, about PFI/PPP issues. He has also worked with the Ministry of Economic Development and Trade of the Russian Federation and the Higher School of Economics of Moscow State University in a programme funded by the European Commission and managed by a UN agency. He was appointed Head of the Science Policy Unit (now Forensic Science and Pathology Unit) in July 2003. He chairs the Policy Advisory Board for Forensic Pathology and is a member of the ACPO Forensic Science Sub-Committee, the Police Science and Technology Strategy Group and the Council for the Registration of Forensic Practitioners.



Stuart Hyde

Stuart Hyde studied Law at Birmingham University and joined Avon & Somerset Constabulary in 1983. In 1997 he was promoted to Detective Superintendent and moved to West Yorkshire Police where he managed crime departments. He then took on a SIO role in Bradford and later became Divisional Commander before transferring to manage Training. He transferred to West Midlands Police as Assistant Chief Constable (Crime) in 2003. He now chairs the National DNA Operations Group as well as being Vice President of the Hi-Tech Crime Consortium, Director of the Society for the Policing of Cyberspace and Deputy Director of the charity 'Bullying Online' (www.bullying.co.uk), which is dedicated to the prevention of bullying in schools.

Requests for information about The National DNA Database under the Freedom of Information Act (FOIA) 2005 should be addressed to: The Custodian of The National DNA Database, Priory House, Gooch Street North, Birmingham B5 6QQ.



The Custodian, Dr Bob Bramley, and the HGC representative, Dr Steve Bain, in discussion

STRATEGIC OBJECTIVE 1: To establish independent oversight of The National DNA Database

Developments in the arrangements for oversight and operation of The National DNA Database

Over the last 5 years, various independent review bodies have called for more public accountability in the way The National DNA Database is operated. Their recommendations have consistently highlighted the need for an independent body to be established with lay membership to oversee the workings of the Database and for the establishment of an Ethics Committee to which they could refer issues for advice. The McFarland Report also recommended that the FSS, who since the inception of The National DNA Database have provided the Custodianship of the Database as well as being the main provider of DNA profiling services for the police, should no longer have that dual role, and that when the FSS moves towards privatisation the Custodianship of the Database should remain in the public sector.

The National DNA Database Board

The Government is discussing new tripartite arrangements for the governance of The National DNA Database with ACPO and the APA. The tripartite bodies are also in discussion with the HGC about ways in which independent oversight of the Database and control of retained samples might be enhanced. The National DNA Database Board that was in place at the start of this year is in the process of changing to a newly reconstituted National DNA Database Strategy Board which will continue to be accountable to the Secretary of State for Home Affairs for the oversight and operation of the Database. In recognition of the fact that The National DNA Database is a police intelligence database, the Board will still be chaired by the Chief Constable holding the forensic science portfolio for ACPO. It will also comprise one representative from each of ACPO, the Home Office and the APA as key stakeholders. It will be advised and supported in its deliberations by the Custodian of The National DNA Database and by lay advisors nominated by the HGC. The decision for the lay advisors not to be Board members was made to preserve their independence and their right to dissent publicly from any decisions of the Board with which they disagreed. The police services in Scotland and Northern Ireland, who have their own DNA databases, will also be invited to participate in meetings.

Ethics committee

The Strategy Board agrees with the calls from the HGC and the Select Committee on Science and Technology for establishment of ethical review and is considering how best to establish an Ethics Review Panel. It is envisaged that this would review not only research requests, but also current and future development of National DNA Database policy, thus providing for clearly independent oversight of the operational and policy decisions made in the course of Database business. The membership of this Panel will be drawn from individuals with appropriate experience on other ethics committees.

National DNA Operations Group

The National DNA Operations Group is continuing under the chairmanship of the ACPO member of the Strategy Board to provide advice and support to the Board on issues related to the operational implementation of Board policies and their impact on crime prevention and detection. This group is made up of representatives from police forces, suppliers of forensic science services and the Custodian.

Separation of Custodianship of The National DNA Database from the FSS

It is currently proposed that the Custodianship of The National DNA Database is transferred from the FSS to a Home Office Delivery Unit. The Custodian will head up a small group providing advice and support to The National DNA Database Strategy Board and be accountable to the Board for implementation of its policies and procedures.

Oversight of profiling laboratories

A key role of the Custodian will continue to be to set the scientific standards for DNA analysis by the profiling laboratories. The Custodian will also be responsible for ensuring that the laboratories have appropriate procedures in place for maintaining the security and integrity of the samples, and information relating to the samples, and that the laboratories meet the performance requirements of the Board. The accreditation and performance monitoring of the profiling laboratories and the management of any corrective actions will thus remain with the Custodian's group.

The Custodian will also continue to chair regular meetings of representatives of the profiling laboratories where the policies of the Board can be disseminated and future scientific developments and applications of The National DNA Database can be discussed.

Provision of National DNA Database operational services

It is important to ensure continuity in supply of the operational services from The National DNA Database whilst these organisational changes are implemented and settle in. To that end, it is currently proposed that, for a period of up to 3 years, the delivery of the operational services will remain with the FSS, through a formal contract managed by the Custodian. It will then be open to competition. The contractualisation of this service will ensure more formal, transparent and legally binding control of the provision of Database services.

Development of The National DNA Database and operational services

There has been a rolling programme of work to develop the IT infrastructure and application software of The National DNA Database, funded through the Home Office DNA Expansion Programme. This will need to continue. It requires a thorough knowledge of the existing arrangements and is intimately associated with the delivery of operational services. The on-going programme of work is constantly reviewed and updated to ensure compatibility with Board's strategic development requirements.

The National DNA Database Board Annual Report and Website

Publication of this Annual Report is part of the wider move to be more transparent about what is held on The National DNA Database and how this is managed and used. The Report is intended to inform stakeholders and the public about achievements over the last year and plans for the future. It also looks back over events of the last 10 years and specifically addresses a number of issues that have been raised in reports from independent review bodies, explaining how their views have been acted upon and why, in some cases, they have not been taken forward.

Information about The National DNA Database can currently be accessed through the FSS website (www.forensic.gov.uk). The Home Office has agreed to host The National DNA Database website once the Custodian group is established. This should then provide better access for the public to view up to date statistics and other information of interest, either directly or via links to other relevant websites.

STRATEGIC OBJECTIVE 2: To obtain DNA profiles from the active criminal population

The Home Office and police forces aim to reduce crime by increasing the efficiency of crime investigation and obtaining more successful prosecutions. If offenders can be identified for their offences more often and more quickly, it should be possible to detect more crime and prevent or deter more crime in the future. It should also improve victim reassurance and so contribute to a reduction of the fear of crime.

The National DNA Database was developed as a means of contributing to the efficiency of crime detection. This section provides details of what records are held on The National DNA Database for individuals and the developments over the last year that have contributed to its growth.

A National DNA Database

The ability to take samples for DNA profiling and to compare these profiles with profiles from unsolved crimes was established under the Police and Criminal Evidence Act 1984 (PACE), as amended by the Criminal Justice and Public Order Act 1994. The establishment of the DNA Database for England and Wales was first announced in Home Office Circular 16/95. In the following year, Home Office Circular 47/96 announced a further amendment to PACE to allow speculative searches of samples, or the information derived from samples, against records held by or on behalf of police forces, not only in England and Wales, but also in Scotland, Northern Ireland, Jersey, Guernsey and the Isle of Man, and cross-searching of DNA databases maintained by, or on behalf of, Scottish forces and the RUC. As a result of these two developments it was expected that a single, consolidated UK-wide database would be created, and all new profiles added to the database, whether they derived from England and Wales, Scotland or Northern Ireland, would be automatically cross-checked against all the searchable profiles already held on the database, irrespective of their territorial origin.

Scotland

Initially, in 1994, ACPO[Scotland] favoured the FSS analysing all samples from Scotland and adding them to The National DNA Database. The enabling legislation in Scotland took effect from 1 April 1996, later than that in England and Wales, but Scotland was not ready to submit samples for profiling until October 1996, by when the FSS had a significant backlog of samples from ACPO forces to analyse and could not offer the level of service required. Largely as a consequence of this, the Tayside Police laboratory developed its capability to take on the analysis of Scottish samples and Scotland began to set up its own DNA database, independent of The National DNA Database, specifically to meet the needs of the Scottish Police Service and the Scottish Division of the Ministry of Defence Police. The Home Office supported this development of local DNA profiling, so long as the results were fed into The National DNA Database. The Tayside Police laboratory was formally accredited to load profiles to The National DNA Database on 23 December 1997 and since then DNA profiles from all subject samples taken in Scotland have been added to The National DNA Database as well as to the Scottish DNA database.

Northern Ireland

The Northern Ireland DNA database operates under different legislation from that in England, Wales and Scotland, the authority arising from the Police (Amendment) (Northern Ireland) Order 1995, but the requirements for the taking and use of DNA samples now exactly mimic those in England and Wales. The database was set up to provide a facility for the Royal Ulster Constabulary (now the Police Service Northern Ireland), who were keen to retain and fully exploit the very close working relationship that existed between themselves and the forensic science laboratory in Belfast. The convenience of sample delivery and face-to-face contact between investigators and database staff was, and remains, much valued. The first subject sample profiles were added to the Northern

Ireland database in mid-1996, but there were no links to The National DNA Database. However, steps have now been taken to load all new subject sample profiles from Northern Ireland to The National DNA Database, commencing in July 2005.

The National DNA Database: subject sample profiles

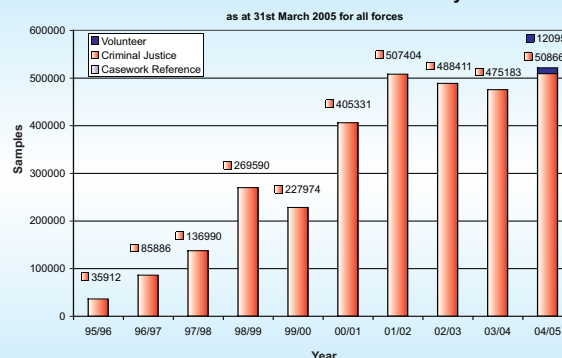
Subject sample profiles originate from casework reference samples, which are submitted to a laboratory from a suspect for comparison with a crime scene sample in a specific case; Criminal Justice (CJ) samples, taken for intelligence purposes only; and volunteer samples obtained for elimination purposes.

Subject sample profiles retained on The National DNA Database

At 31 March 2005, The National DNA Database held 3,085,766 subject sample records. During 2004/2005, 521,117 new subject sample records were added (an increase of 9.6% on 2003/2004).

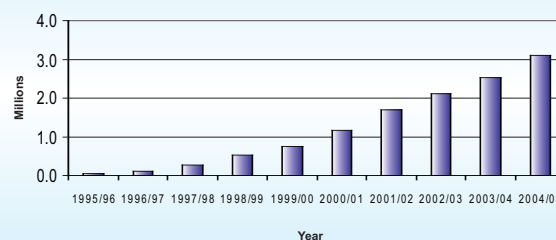
The marked annual increase in subject sample profiles held on the Database from 2000 is a consequence of implementation in England and Wales of the Home Office DNA Expansion Programme in 2000 and the Criminal Justice and Police Act 2001. As the proportion of the offender population on the Database grew, it was only to be expected that the numbers of offenders remaining eligible to be sampled would reduce. This could explain why the number of offender profiles loaded to the Database peaked in 2001/2002 and then started to fall in 2002/2003 and 2003/2004. The rise in 2004/05 is a result of the commencement of arrestee sampling following implementation of the Criminal Justice Act 2003.

(fig 1) Number of Subject Sample DNA Profiles loaded to the National DNA Database annually



* This graph has been generated from a reporting database which accounts for all profiles loaded since 1995. It is a different source from that used in previous Annual Reports and may contain slight differences.

(fig 2) Number of Subject Sample DNA Profiles retained on The National DNA Database



The number of individuals would be lower (see page 8)

STRATEGIC OBJECTIVE 2: - continued

All subject sample records on The National DNA Database are uniquely identified by a bar code number (supplied with the sampling kits). In addition to the DNA profile, they also contain information about the subject's name, date of birth, ethnic appearance and gender; information relating to the sampling force and the supplier laboratory to which the sample was submitted and details of the sample type and the test type. Records relating to samples taken under PACE also contain the Arrest Summons Number (ASN), which facilitates reconciliation of data with the Police National Computer (PNC). The type of offence for which the subject sample was taken is not recorded.

DNA profiles by type of sample

At 31 March 2005, there were 3,072,041 C.J/PACE sample profiles, 12,095 volunteer sample profiles and 1,630 casework reference sample profiles retained on to The National DNA Database.

DNA profiles by type of analysis

At 31 March 2005, 562,515 (23%) of the subject sample profiles on The National DNA Database were full SGM profiles; 2,443,684 (77%) were full SGM Plus® profiles. An SGM profile is essentially a partial SGM Plus® profile. The change from SGM to SGM Plus® was introduced in 1999, primarily to reduce the risk of an adventitious or chance match as the size of the Database increased.

The cost of upgrading all SGM profiles to SGM Plus® is prohibitive, but the police are encouraged to upgrade all SGM profiles that are involved in matches with crime scene sample profiles before taking any further action. For 50,175 (8.9%) of the 562,515 SGM subject sample profiles on the Database there is also a SGM Plus® profile, reflecting the level of upgrading that is taking place.

DNA profiles by type of offence

There is no record on The National DNA Database of the type of offence for which samples from subjects have been taken. However, this information is collected at the time of sampling and is recorded on the PNC.

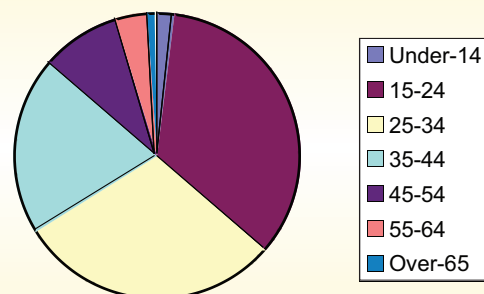
DNA profiles by age of subject

The age distribution of the population of persons represented on the Database is shown in figures 3 and 4.

DNA profiles by gender of subject

82% of the subject sample profiles have been obtained from males and 18% from females. (The split of 98% males: 2% females reported in last year's Annual Report was an error)

(fig 4) The age distribution of the population of persons represented on The National DNA Database as at 31/03/05



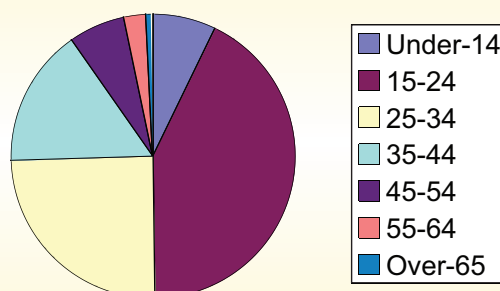
These data are based on information provided from the PNC.

Home Office Research Study 275, *Offending in England and Wales*, presented the first analysis of the 2003 Crime and Justice Survey in relation to seven offence categories and 20 core offences, including burglary, theft, criminal damage, assault, robbery and drugs offences.

The peak rate of offending was among young persons. A third of all 14-17 years olds, a quarter of 12-13 year olds and a quarter of 18-19 year olds had committed a core offence. The highest rate of offending was among boys aged between 14 and 17, of which four in ten admitted a core offence in the last year.

Those aged between 10-17 and 18-25 each accounted for about a third of offences. Males aged between 10-25 accounted for almost half of all offences committed.

(fig 3) The age distribution of subjects when sample profile records were loaded to The National DNA Database



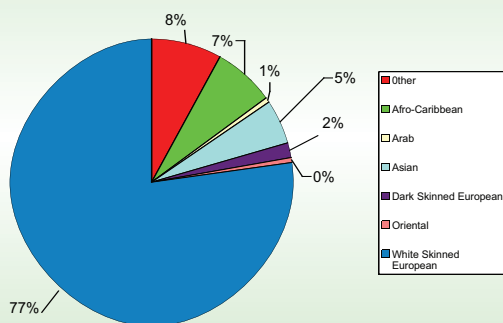
These data are based on information provided from the PNC.

STRATEGIC OBJECTIVE 2: - continued

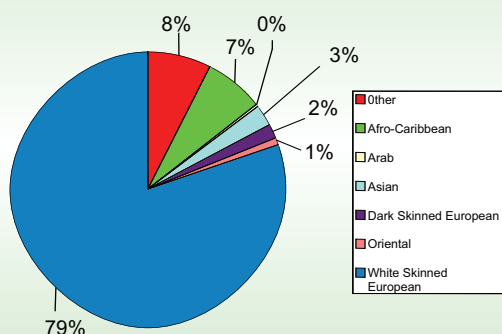
DNA profiles by ethnic appearance of subject

The distribution of persons represented on the Database by ethnic appearance (as recorded by the police) is shown in figures 5-7 (note that these data relate only to those records for which ethnic appearance has been recorded. No data is recorded for 10% of samples).

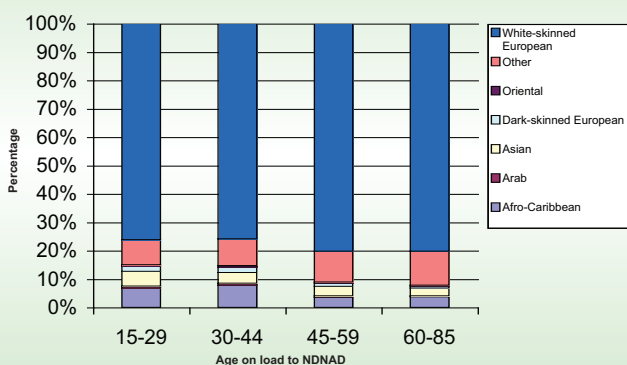
(fig 5) The ethnic appearance distribution of records for male individuals as at 31/03/05



(fig 6) The ethnic appearance distribution of records for female individuals as at 31/03/05



(fig 7) Age and ethnic appearance distribution on The National DNA Database as at 31/03/05



The ethnic appearance data are based on the judgement of police officers taking the DNA samples as to which of seven broad ethnic appearance categories they consider the individuals to belong. They are recorded solely for police intelligence purposes, to assist in subsequent identification of a suspect identified through a match on The National DNA Database. The Office for National Statistics population data from Census 2001 are based on self-reporting by individuals when completing the Census return as to which of 16 ethnic groups they consider they belong. The data held on The National DNA Database relating to ethnic appearance are thus not directly comparable with the Census 2001 population data based on self-reported ethnic origin and such comparison could give a misleading impression of ethnic disproportionality. Nevertheless, people who are classified by the police as black based on their appearance are clearly represented in relatively greater proportion on The National DNA Database than those whom they classify as white skinned European.

Replicate sampling

The number of subject sample profiles on The National DNA Database is significantly greater than the number of separate individuals this represents. This is due to samples being taken and analysed from some individuals on more than one occasion. A small-scale study estimated the current level of replication on The National DNA Database to be about 10%.

The Custodian has been developing a more systematic means of accurately monitoring the replication levels at force and national level over the last year, with a view to identifying best practice and hence improving forces business processes using PACE and the fingerprint database (IDENT1) to establish whether a sample needs to be taken.

However, some causes of replication are unavoidable or the result of deliberate policy. For example, the existing profile on the Database may be under an alias, or from volunteers, or Scotland for which the fact that a record already exists on the Database cannot be identified through PNC when the police are taking a sample. The existing profile for the individual may also be on the Database as a partial or SGM profile and a second sample may be taken in order to obtain a full SGM Plus® profile to improve the discriminating power.

In Scotland, where the legislation is different, a certain amount of replication is necessary to reduce the risk of a profile for an individual being lost. For example, if a person is not convicted by a court, or they have been arrested and disposed of by Fixed Penalty, Procurator Fiscal Fine, Conditional Offer or any other "Non-Court Disposal", their records must be removed from the Scottish database and The National DNA Database. This includes recidivist juvenile criminals whose cases are disposed of outwith the court system by means of a Juvenile Panel. There is also an ACPO [Scotland] policy that requires officers always to obtain mouth swabs from anyone arrested or detained for crimes of violence, sexual offences or theft and Scottish officers in addition have a general instruction to swab anyone should they deem it appropriate to do so.

If all the replicates on The National DNA Database were due to repeat sampling, this would be equivalent to the Database containing profiles from approximately 2,714,800 different individuals as at 31st March 2005.

STRATEGIC OBJECTIVE 2: - continued

Replicate samples vs chance matches

It is possible that some of the 'replicates' on The National DNA Database are chance matches of profiles from different individuals. It is important to be able to identify with certainty whether these identical profiles are chance matches or the result of replicate sampling of the same individual. The former would lead to a more reliable estimate being obtained for the match probability of the SGM Plus® DNA profiling system. The latter would help identify aliases and assist in development of best practice to reduce the incidence of avoidable replicate sampling and the overall cost of sampling and analysis.

The probability of a match between the SGM Plus® profiles of two unrelated individuals, if the values of the markers were all independent, would be of the order 1 in a trillion (a trillion is a million million). It will be much larger for related individuals – of the order 1 in 10,000 for full siblings. The DNA profiles of identical twins will be the same.

It has not been possible, as yet, to establish the validity of the 1 in a trillion match probability to a level of reliability sufficient for casework. So, when we report a full SGM Plus® profiling match it is usual practice to quote a robust and cautious match probability of 1 in a billion (a billion is a thousand million).

We have approximately 2.7 million SGM Plus® profiles on The National DNA Database from different individuals. If we compared each one against every other we would make approximately 3.7 trillion comparisons. If the match probability were of the order 1 in a billion then we would expect to see approximately 3,700 instances of matches between unrelated individuals. However, indications from work we have done so far are that the number is much less than this, confirming that the 1 in a billion figure is very cautious. Our belief is that a match probability of 1 in a trillion is nearer the mark but we will need to complete a large scale exercise, currently in progress (see p30), before we can confirm this.

A DNA match can only provide evidence of identity, and the Crown Prosecution Service (CPS) will not prosecute on DNA evidence in the absence of other supporting evidence.

Legislative developments underpinning growth of The National DNA Database

Initially, under the Criminal Justice and Public Order Act 1994, samples could only be taken from persons charged with, informed that they will be reported for, or convicted of a recordable offence, and the sample and profiles had to be destroyed if the person was not prosecuted or was acquitted for the offence for which the samples were taken. Since then there have been several changes in the legislation, allowing samples to be taken and the samples and profiles to be retained in a wider range of circumstances. However, samples and profiles that are retained can only be used for purposes related to the prevention and detection of crime, the investigation of an offence, the conduct of a prosecution, or the identification of a deceased person or of the person from whom a body part came.

Criminal Evidence Act 1997

Prisoner DNA sampling programme

By virtue of section 63 of PACE, as amended by the Criminal Evidence Act 1997, the police were able to obtain DNA samples from persons who are convicted of a recordable offence on or after 10 April 1995 (and in relation to those convicted for particular offences prior to that date) and from persons who were detained on the order of the court, following their acquittal on the grounds of insanity or a finding of unfitness to plead.

A Prisoner Sampling Programme was conducted from January until August 2003 in recognition of that fact that a significant number of offenders who were serving prison sentences, or were detained in secure psychiatric establishments, had not previously provided DNA samples for profiling.

In total, some 3,800 DNA profiles were loaded to The National DNA Database from samples obtained through this exercise.

Criminal Justice and Police Act 2001 (CJPA)

Profiles from persons not prosecuted or acquitted

Between 1995 and 2001, in compliance with the legislation in England, Wales and Scotland at that time, 245,530 subject sample profiles were removed from The National DNA Database. At an estimated replication rate of 10%, this would represent profiles from about 221,000 separate individuals.

The CJPA removed the obligation to destroy DNA samples and profiles in the event of there being no prosecution or an acquittal, so long as the samples had been lawfully taken.

S & Marper

These provisions of the CJPA have been challenged by way of judicial review in the case *R v Chief Constable of South Yorkshire [ex parte S and Marper]* on the grounds that they violate the appellants' human rights. The Court of Appeal found that although there was some breach of Article 8 of the European Convention on Human Rights, it was proportionate and justified, and there was no breach of Article 14. The cases were appealed further to the House of Lords, where the decision of the lower Court was upheld in a judgement given on 22 July 2004.

On 16 August 2004, the solicitors for S & Marper submitted Applications to the European Court of Human Rights alleging violations of Article 8 and 14 of the Convention, as before the domestic courts. [On 10 May 2005, the Court agreed to proceed with the Applications and invited the Government to submit written observations on the admissibility and merits of the cases].

DNA profiles from subject samples taken from persons charged in Scotland still have to be removed from the Database if there is no subsequent conviction at court.

It is not currently possible to identify specifically those records retained on The National DNA Database that relate to persons who have not been prosecuted, or who have been acquitted of the offence for which the sample was obtained. However, such records are separately identified along with others as having a parent PNC record deleted. As at 31 March 2005, there were 241,473 such records in total on The National DNA Database and it has been estimated that about 86% of these relate to persons who have not been prosecuted or have been acquitted. Allowing for a 10% replication rate among all subject sample records, it is estimated that there are roughly 186,900 DNA profiles from different individuals on The National DNA Database which, prior to the legislative change in 2001, would have been removed.

STRATEGIC OBJECTIVE 2: - continued

Profiles from volunteers

The CIPA allowed persons who had provided samples voluntarily for DNA profiling for elimination purposes also to give written consent for their profiles to be permanently retained and speculatively searched against profiles from undetected crimes. Once such consent is given it cannot then be withdrawn. At 31 March 2005, 12,095 volunteer sample profiles had been added to The National DNA Database.

Legislation relating to volunteers in Scotland came into force this year, but, unlike the position in England and Wales, the volunteer may withdraw consent to their DNA profile being retained on the Database at any time. Also, none of the Scottish volunteer sample profiles have been added to The National DNA Database, although they are retained on the Scottish Database.

Criminal Justice and Police Act (Commencement No. 8) Order 2002, which came into force on 1st January 2003, extended the powers of the police under the Police and Criminal Evidence Act (PACE) 1984 in relation to the re-taking of non-intimate DNA samples where the first sample proved insufficient or unsatisfactory. The term insufficient was extended to include circumstances where the first sample is lost, destroyed, contaminated or damaged, and where the analysis of the sample has produced no results or unreliable results. However, the ability to re-take a sample under the wider circumstances applies only to samples obtained after the individual has been charged. It does not apply where the sample is taken from an arrestee.

Criminal Justice Act 2003 (CJA)

Profiles from arrestees

From 5 April 2004, Sections 9 & 10 the Criminal Justice Act 2003 (CJA) extended police powers under PACE to allow a DNA sample to be taken from all persons arrested for a recordable offence and detained in a police station. The change was to allow offenders to be identified at an earlier stage than would previously have been possible, prior to any charges being brought, with corresponding savings in police time and costs.

This change in legislation led to an overall increase of 71,600 samples (14%) being taken for the year, although the level of sampling increased steadily during the course of the year, and for the month of March 2005, there was a 32% increase in samples taken compared with March 2004. This growth profile reflects the increasing take-up of the new powers by police forces over the year as they put the required IT and procedural changes in place to enable DNA sampling of arrestees. Arrestee sample profiles cannot currently be distinguished from other subject sample profiles on The National DNA Database.

Policy developments underpinning growth of The National DNA Database

The Home Office DNA Expansion Programme

Between 1995 and March 2000, the number of subject sample profiles on The National DNA Database increased slowly from zero to 750,000, funded entirely from within force budgets. The DNA Expansion Programme was set up in April 2000 to accelerate the growth of the

Database, with the primary aim* of holding a DNA profile for all known active offenders (estimated at between 2.3-2.65m offenders) on the Database by March 2004. Central funding of £182.6m was provided to police forces between 2000/2004, against approximately £19m per annum from forces' own budgets, and the target was achieved. A further £58.3m of funding was provided in 2004/2005, to keep the Database fully populated with current active offenders and newcomers to crime, and funding is set to continue in 2005/2006.

Assimilation of subject sample profiles from Scotland into The National DNA Database

During the last year, 43,315 subject sample profiles were transferred to The National DNA Database from Scotland, increasing the total number of Scottish subject sample records on The National DNA Database to 169,651.

Assimilation of subject sample profiles from Northern Ireland into The National DNA Database

It is anticipated that FSNi will load some 10,000 or so new subject sample profiles to The National DNA Database each year, once it has been accredited to do so.

FSNi also holds about 50,000 subject sample profiles on the Northern Ireland database that were obtained prior to FSNi becoming an approved supplier to The National DNA Database. The police have asked for these to be added to The National DNA Database as well. However, some 13,000 of them are SGM profiles and these will not be transferable without upgrading to SGM Plus® as it has been decided that any new profiles added to The National DNA Database must be based on SGM Plus® profiling. The remaining 37,000 are SGM Plus® profiles, but 4,000 of these have been identified as replicates and these will also not be transferred to The National DNA Database. This leaves about 33,000 SGM Plus® profiles from subject samples that could be transferred and special arrangements are being made for this, probably around mid-July, 2005.

Weeding rules

ACPO has commissioned the development of Retention Guidelines to replace the existing rules that govern the weeding of criminal conviction histories from the PNC and IDENT 1. These may also have implications for retention of data on The National DNA Database. These new guidelines will be predicated in favour of long term data retention, in the vast majority of cases, until the subject is deemed to have attained 100 years of age. These changes are necessary following the introduction of new legislation affecting the taking and retention of fingerprints and DNA samples in the CIPA and the CJA. The guidelines have also been influenced by the House of Lords judgement in the case of S & Marper and the outcome of the Bichard Inquiry. It is intended that the guidelines will form part of the Guidance issued under the Code for Management of Police Information, due to be published in November 2005.

Removal of replicates

Although retention of replicate profiles does not compromise the integrity of The National DNA Database, their retention is unnecessary. An exercise is thus under way to identify all such redundant profiles in order to remove them from the Database and destroy the samples. This will require careful work, involving the use of PNC and fingerprint records in addition to The National DNA Database, to ensure that what appear to be replicates actually came from the same person and that the most recent (preferably SGM Plus®) profile is retained. The number of profiles on the Database will consequently appear to go down, but no useful information will be lost and the quality of performance of the Database will improve.

* The DNA Expansion Programme also enabled the retrieval of more trace DNA material left by offenders at crime scenes, particularly volume crime scenes - burglary and vehicle crime - where police clear-up rates were traditionally lower (see page 18).

STRATEGIC OBJECTIVE 3: To maintain public confidence in the security and integrity of The National DNA Database and its use

The public have a right to expect the highest possible standards in the taking of samples by the police, the way in which profiles are obtained from these samples by the laboratory, and the safeguards for how they are stored on The National DNA Database and used. A wide range of measures are taken to provide this assurance.

New sampling kits and processes

Sampling kits are provided to minimise the risk of loss of integrity of the samples and to ensure that all the required information is obtained and recorded in a standard format.



In 2004, The National DNA Database Board decided to replace the three kits that had been in use since the inception of the Database by two new kits, one for taking samples under PACE and

one for taking samples from volunteers (these are termed 'PACE Kit' and 'Volunteer Kit'). The single kit for taking samples from volunteers has been specifically designed with a view to removing any ambiguity about the form of consent being provided when giving the sample, whether it is for the sample to be used solely for elimination purposes in respect of a specific criminal investigation or additionally for the profile to be retained on The National DNA Database.

Supplier laboratories

Supplier market

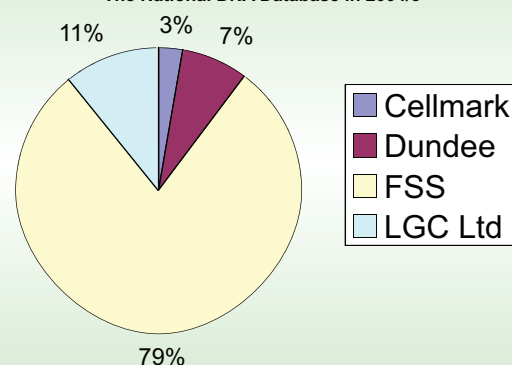
There are currently 5 organisations (7 separate supplier laboratory units) accredited to supply subject sample profiles to The National DNA Database and 5 organisations (12 separate laboratory units) accredited to supply crime scene sample profiles.

In England and Wales the analysis of subject and crime scene sample processing is performed by the Forensic Science Service, LGC Limited and Orchid Cellmark. A number of other organisations are in contact with the Custodian with a view to gaining accreditation for crime scene sample processing in the future.

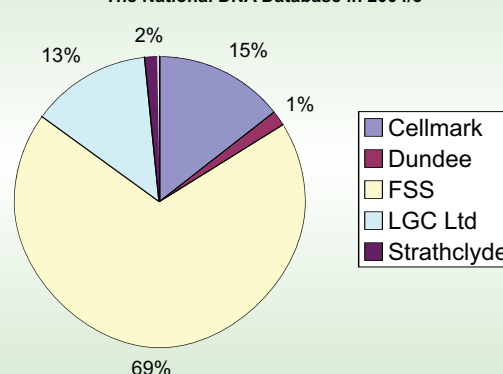
The Dundee laboratory carries out analysis of all subject samples in Scotland and all crime scene samples on behalf of the Dundee, Lothian & Borders and Aberdeen police forensic science laboratories. It also maintains the Scottish DNA database and is accredited to load profiles to The National DNA Database, to which it exports all of its subject sample profiles and undetected crime scene sample profiles. The Strathclyde Police forensic science laboratory analyses its own crime scene samples for the Scottish DNA database and is accredited for its crime scene sample profiles to be added to The National DNA Database. The Lothian and Borders and Grampian laboratories are currently in the process of gaining similar accreditation.

The Forensic Science Northern Ireland (FSNI) laboratory analyses all DNA samples in Northern Ireland and maintains the Northern Ireland DNA database. It is shortly expected to gain accreditation for addition of its subject sample profiles to The National DNA Database and has plans to be accredited to load its crime scene sample profiles to The National DNA Database as well.

(fig 8) Market share of CJ sample profiles loaded to The National DNA Database in 2004/5



(fig 9) Market share of SOC sample profiles loaded to The National DNA Database in 2004/5



Accreditation of new suppliers

All prospective new suppliers of profiles to The National DNA Database must demonstrate to the Custodian that they can provide reliable profiles that are compatible with those from other suppliers.

In order to do this, they are first required to satisfy the United Kingdom Accreditation Service (UKAS) that they meet the requirements of the international quality standard for testing laboratories, ISO 17025, and the additional requirements of the Custodian as set out in the UKAS document LAB 32. LAB 32 was originally drawn up between the Custodian and UKAS in recognition of the fact that the Custodianship sat within the FSS and there were commercial sensitivities about staff employed by the FSS inspecting the premises of their competitors. The non-FSS suppliers now have greater confidence in the independence demonstrated by Custodian staff and their ability to handle their commercially sensitive information confidentially. So Custodian staff are now being trained as UKAS technical auditors and have started to assist with these on-site inspections.



STRATEGIC OBJECTIVE 3: - continued

Prospective suppliers also have to satisfactorily complete one or more proficiency tests provided by the Custodian Accreditation Services (CAS) team. This team assesses the supplier's performance in the proficiency tests and, where appropriate, recommends to the Custodian their acceptance as an accredited supplier. The Custodian is responsible for recommending their acceptance to The National DNA Database Board.

During 2004/05, the CAS team carried out two initial accreditation exercises for new suppliers.

Changes to scope

Any existing supplier who wishes to change the scope of their accreditation or make significant changes to their accredited processes also has to satisfy the Custodian that the changes proposed have been properly validated and will produce reliable profiles compatible with those on the Database from other suppliers. This may require participation of the supplier in further proficiency tests or, where appropriate, back-to-back testing of the new process against the older one.

During 2004/05, the CAS team carried out 19 validation reviews relating to extensions to scope and changes to accredited processes.

On-going performance monitoring

Once accredited, suppliers are also required to participate in the on-going declared and undeclared proficiency testing programme provided by the CAS team.

Significant changes in the supplier monitoring framework will be introduced from April 2005. These have been developed by the CAS team in consultation with suppliers and are largely aimed at maximising the benefits to both the suppliers and the Custodian by enhancing those components of the existing system that experience has shown are best at identifying issues of concern at the expense of those that have proved to be less effective. Until now, suppliers have been provided with an undeclared proficiency test (two samples) every six months and a declared proficiency test (five samples) every month, with a detailed review of the underlying processes being carried out for each of the undeclared tests and one of the declared tests. The undeclared proficiency tests are more informative and provide the best way of checking suppliers' end-to-end processes, but are resource intensive and there have been significant delays in reporting back on performance. So in future, these tests will be provided every three months, but only one of them will be subject to detailed review and this will allow more prompt feedback on performance. The declared proficiency tests also provide valuable information, but again they were taking too much resource. They will therefore be decreased in frequency, to once every three months, but the number of samples per test will be increased to ten.

Suppliers of subject sample profiles are also required to duplicate 5-10% of their analyses to demonstrate process control, and to report any errors to the Custodian. Hitherto, this has not been a requirement for suppliers of crime scene sample profiles, but comparable process control arrangements are currently under discussion and will shortly form part of the Custodian's monitoring regime.

Quality assurance of The National DNA Database

Data integrity

The Custodian is responsible for ensuring, as far as possible, that all data for The National DNA Database is correct at the time it is added, for correcting any data that subsequently turn out to be incorrect, and for making any changes to the data when required to do so (for example, to comply with weeding rules governing the removal of records from PNC or for upgrading DNA profiles).

Pre-loading checks

The Custodian is responsible for loading to The National DNA Database the PACE sample stub records from PNC and the associated DNA profiles from supplier laboratories; equivalent records from the Scottish DNA database; and volunteer and crime scene sample records from suppliers (see page 15). Quality checks are carried out on loading to ensure that the data are in the correct format and meet the specified requirements.

In April 2004, the Custodian released a new version of the loader software which contained an enhancement aimed at improving the data integrity rules and producing a message when a rule is breached, for communication to the supplier laboratory in question, to resolve the problem. This may require the assistance of the police and, if necessary, resubmission of the sample.

For subject samples taken under PACE in England and Wales, these checks are on compliance with the permissible data field values, and for compatibility between the loaded profile and the information provided from PNC for the Arrest Summons Number, bar code number and gender. For Scottish subject samples and volunteer samples, the checks are restricted to ensuring that all the required data field values have been provided.

For crime scene samples, the checks are against the permissible data field values and compliance with the minimum load criteria (see page 16). The opportunity was also taken to improve the Match Probability Screening Application (MPSA) which prevents any profiles that do not meet a minimum match probability of one in a million from being loaded to the Database. Unfortunately, this did not prevent partial profiles that met this criterion being loaded and producing an unmanageable number of matches. The improved filter now only allows through profiles which have a minimum of eight full SGM markers present, of which two have to be at one of the discriminating loci (FGA, D21 or D18) used to make the first cut of the Database during a speculative search.

Post-loading checks

The Custodian carries out a number of checks on the validity of data post-loading. These include the identification of incompatibilities between the recorded gender and the result of the Amelogenin sex test; anomalous dates of birth; and profiles that would have given rise to matches but for one marker in the profiles being different.

The 'gender anomalies' may be due to clerical errors or sample/data switches, or reflect a true genetic condition. The anomalous dates of birth are usually clerical errors. Checks on both are important, not only for data integrity purposes, but also to ensure that when specialised searches of the Database are undertaken with restrictions based on gender or age there are no profiles included or excluded inappropriately.

The identification of profiles that would have matched but for a difference between the profiles at one of the markers has proved to be a very effective way of identifying other data transcription errors and sample

STRATEGIC OBJECTIVE 3: - continued

handling errors. Such errors are more prevalent with crime scene samples because of the complexity of interpreting profiles from low levels of DNA and mixtures, and the higher level of manual intervention in the interpretation process. Following amendment of the profiles on The National DNA Database, reports are issued to the police withdrawing matches that had been reported based on the previously incorrect profile and new match reports are issued based on the amended profile.

Compatibility between The National DNA Database and PNC

An electronic link was established in 2001 between The National DNA Database and PNC. Demographic details relating to persons from whom samples have been taken under PACE are transferred from PNC through this link to the Database and, once the profile has subsequently loaded to the Database, a message is sent back to update the PNC record (see diagram showing end to end process on page 15). Establishment of the link represented a step change in the evolution of the Database, in that it has enabled police officers to check in real time as to whether a suspect in custody has a profile already on the Database. As such, the link has allowed the Database to become an integral part of the Criminal Justice System – a key Government objective.

It is vitally important to maintain compatibility between records on The National DNA Database and records on PNC and a great deal of work has been undertaken to this end on behalf of the Custodian by a Home Office funded Data Quality and Integrity Team.

A recent comparison of extracts of data from The National DNA Database and PNC has provided reassurance in the stringent validation logic of the link and demonstrated that where there is a DNA record on PNC there is a 99.1% convergence of that record with what is held on The National DNA Database.

In 2005/06, a quality assurance exercise will be carried out in collaboration with the Police Information Technology Organisation (PITO) to check for subjects with matching DNA profiles on The National DNA Database but non-matching fingerprints on IDENT 1, and subjects with matching fingerprints but non-matching DNA profiles. The aim is to investigate and rectify any inconsistencies caused by suspects using aliases, or clerical errors, and to identify identical twins with records on The National DNA Database and IDENT 1, thereby providing added confidence in the integrity of the data on both The National DNA Database and IDENT 1.

This analysis will also provide another opportunity to investigate what appear to be chance matches between full SGM Plus® profiles on The National DNA Database from different individuals, by using the associated data held on PNC and IDENT 1. This in turn will allow us to re-evaluate the match probability quoted for SGM Plus® (currently 1 in 1 billion) and to flag any short to medium term need for the number of STR loci stored on The National DNA Database to be increased. The results of this exercise will be published in due course.

Match reporting checks

All matches between subject and crime scene sample profiles, and between different crime scene sample profiles, are reported to the police for intelligence purposes as soon as they are available. However, some of these matches may not be true matches. The values of some markers in the DNA profiles were not capable of being distinguished in the early days of the Database and so were grouped together (or 'binned') as a single marker. The values of some other markers are only very rarely seen and have not been fully validated, so are recorded on the Database as 'R'. This acts as a wildcard value which matches all other values at that marker

when speculative searches are undertaken. There is thus a post-match reporting check on the actual values of the binned and the rare markers and a second report then goes out to the police, if required, to invalidate the first 'provisional' match.

Each match report is also accompanied by one or more caveats, drawing the attention of the police to any limitations in the value of the match. These caveats cover, for example, situations where the checks on grouped and rare markers still need to be carried out, and where the match involves a partial profile (including a full SGM profile) or a profile obtained using low copy number DNA analysis (for which the origin of the profile cannot always be established with certainty). A note is also provided giving advice on the appropriate action to be taken. For example, if a match involves a SGM profile, the police are advised that they should ensure compliance with the Prosecution Team (ACPO and CPS) DNA Guidance and Home Office Circular 58/2004, that the match probability can be improved by upgrading the analysis to SGM Plus® and that this upgrading may either confirm the match or eliminate the individual as a suspect.

Compliance with legislation and policy for removing profiles from the Database

The Custodian is accountable to The National DNA Database Board for ensuring that the profiles on the Database are retained and used in compliance with legislation and Board policies. There is currently no legal requirement for any DNA profiles obtained from samples from suspects or volunteers by forces in England and Wales to be removed from the Database. However, there is a significant number of replicate profiles on the Database (see page 10) due to the same individual being sampled on more than one occasion and the Board sees advantage in these being removed. This action is being taken forward in conjunction with PITO to ensure that associated records on PNC are modified accordingly.

Scottish legislation is different and requires that subject sample profiles be destroyed if the individual has been acquitted. Such profiles are removed from The National DNA Database on a monthly basis following receipt of instructions from the Dundee laboratory.

There is no legislation regarding the removal of crime scene sample profiles from The National DNA Database. Until recently, the Board's policy has been for them to remain on the Database until the relevant force requests their removal following judicial disposal of the case or because they relate to offences which they no longer wish to investigate. However, the administration of this approach has proved complex and inefficient for the police, resulting in many crime scene sample profiles remaining on the Database when they are no longer of interest, and in match reports being sent to the police in respect of these profiles which they have been informed of previously or they no longer wish to pursue. The Board therefore recently redefined its policy allowing the immediate automatic removal of all scene of crime profiles involved in a full SGM Plus® to SGM Plus® match with a subject sample profile.

Concern has been expressed that the removal of crime scene sample profiles following a match would preclude the possibility of alternative suspects being identified as new subject sample profiles are subsequently added to the Database, thereby missing the opportunity to investigate a possible miscarriage of justice. Further consideration is therefore being given by the Board to transferring these crime scene sample profiles to an archive database, rather than destroying them, and periodically searching these against The National DNA Database. This would also allow better support to be given to any possible post-conviction investigative work.

STRATEGIC OBJECTIVE 3: - continued

Investigation of potential errors

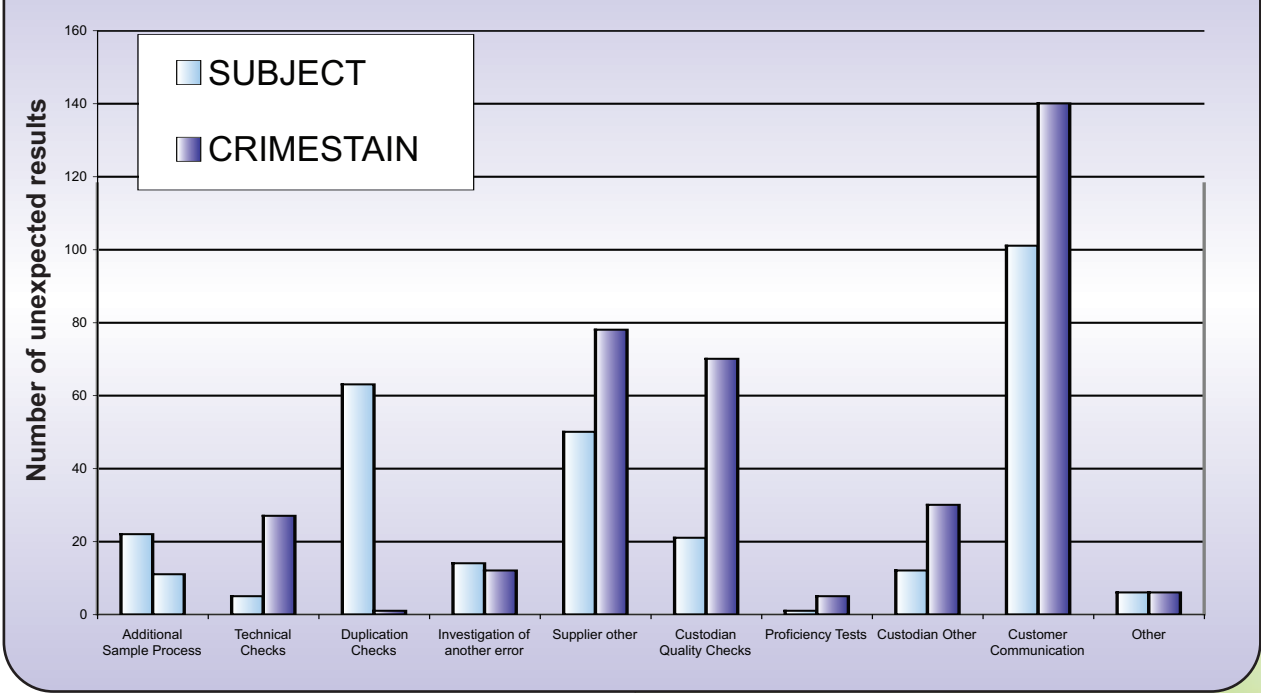
No matter how many precautions are taken and checks are made, errors will still occur. Potential errors are initially described as 'unexpected results'. Figure 10 shows the ways in which the unexpected results were identified during 2004/05 and the numbers identified using each approach.

The Custodian requires such unexpected results to be investigated as a matter of urgency, and has set a target of 20 days for their resolution.

Audit trails

At the moment, the audit trail for the creation of and changes to a record on the Database is somewhat limited and the information is time consuming to retrieve. This will be improved significantly in the next financial year by implementation of an IT enhancement which will be capable of recording details of all events (e.g. an administrative change against the samples details or a gender anomaly check or the date when the profile has been loaded to NDNAD) against the profile record.

(fig 10) How unexpected results were identified during 2004/5



Suspension, reinstatement, amendment and deletion

Whilst investigations into potential errors are under way, the record is suspended from The National DNA Database. The profile is thus not involved in any speculative searches of the Database to prevent the risk of any potentially misleading information being reported.

Once the investigation has been completed to the satisfaction of the Custodian, if it is established that the result was correct it is immediately reinstated and is once again involved in the speculative searches of the Database. If the result was incorrect, the Custodian requires that appropriate action is taken to rectify it, to check for any wider implications for other records on the Database and to identify what can be done to reduce the risk of any recurrence. The record can amended and again be available for speculative searching, or deleted from the Database, as appropriate.

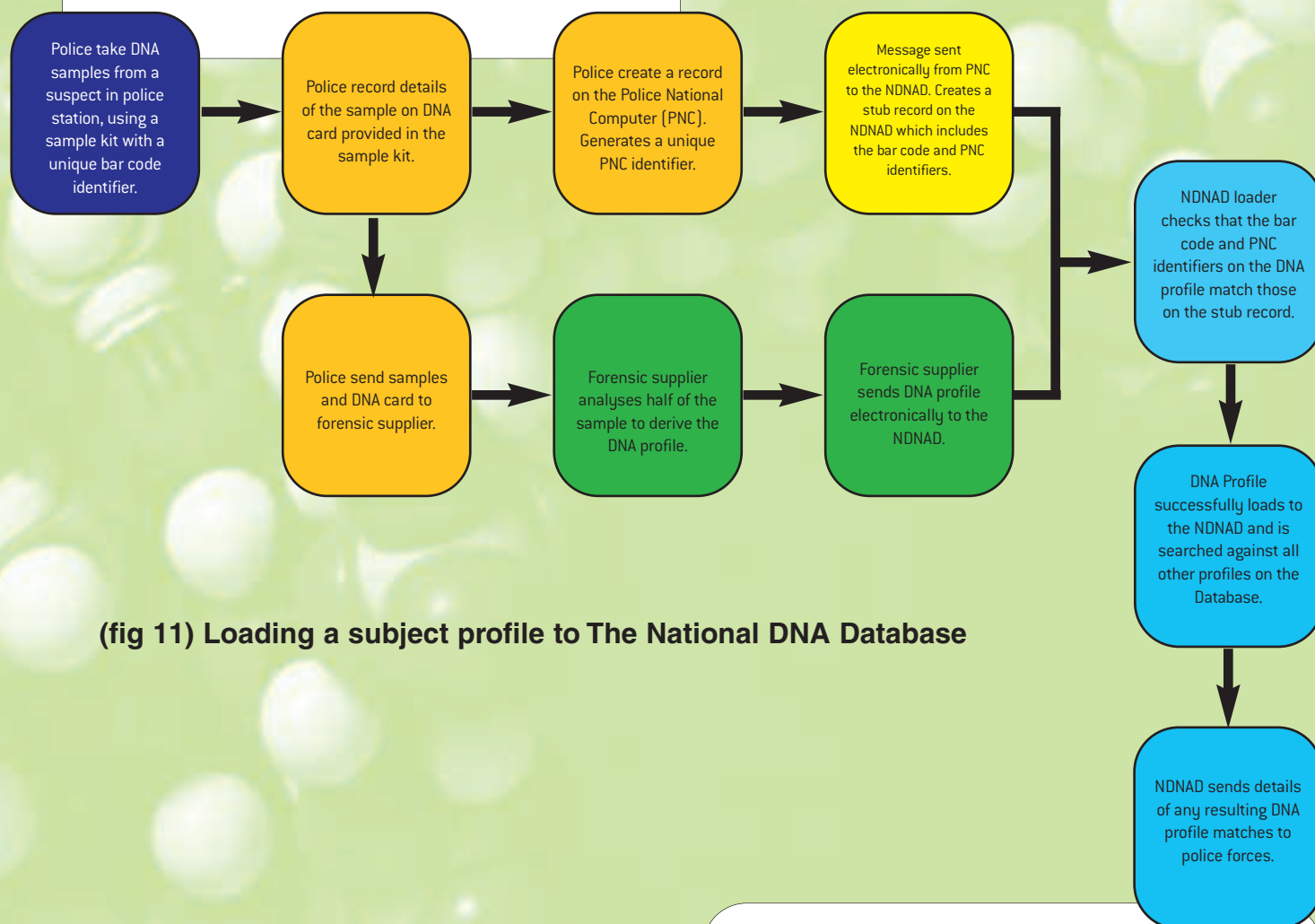
If the record is changed or deleted, the police are informed of the fact, and of any matches involving the record in its previous form, so that they can consider what, if any, action needs to be taken in respect of these.

Details of all the investigations and actions taken are fully documented by the Custodian.

STRATEGIC OBJECTIVE 4: To improve the use and effectiveness of The National DNA Database

The end-to end process

In order to improve the use and effectiveness of The National DNA Database, the whole end to end process from the collection of samples from subjects and crime scenes to the conviction of offenders has to be efficient, focussed and well controlled. There also has to be good communication of best practice and continuous development of the Database infrastructure and applications. The schematics in Fig 11 and Fig 12 describes the key steps in this process.



(fig 11) Loading a subject profile to The National DNA Database

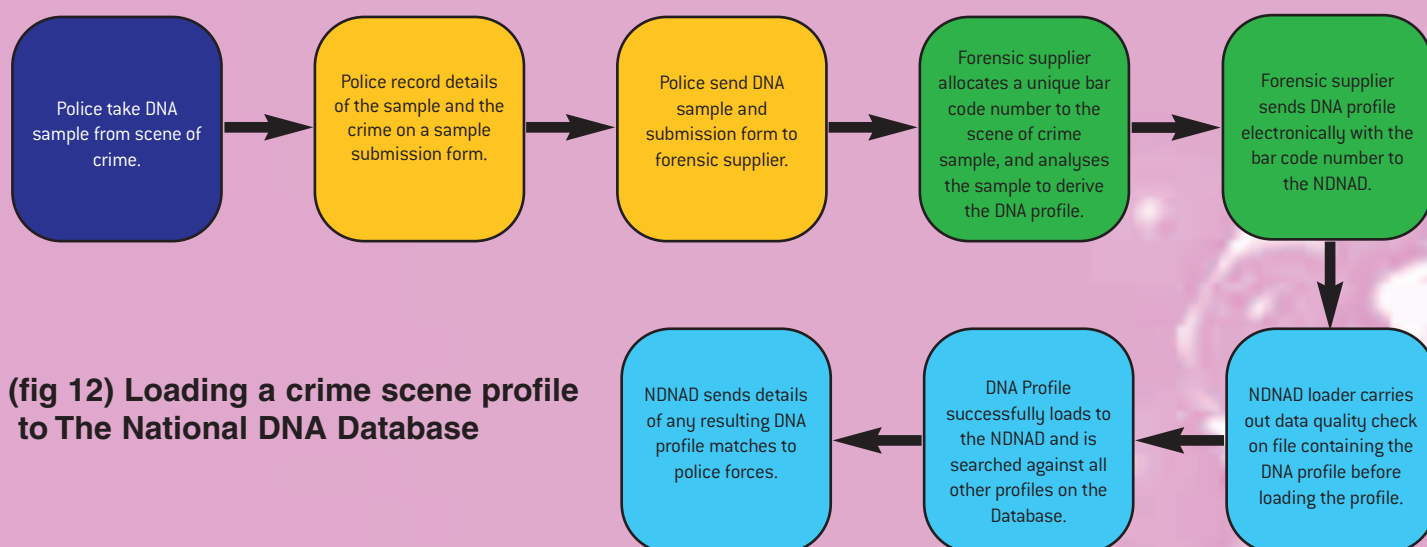
Note 1:

The above process applies only to subject samples taken by forces in England and Wales. The profiles from subject samples from Scotland, and from volunteers, are loaded via a simpler process, not linked to PNC, where the supplier records all of the relevant demographic details as well as the profile details in a single file which is sent to The National DNA Database for loading.

Note 2:

If a profile is rejected on attempted loading, it is referred back to the supplier laboratory for investigation, amendment and resubmission. Depending on the cause of the problem, the supplier laboratory may need to liaise with the force that created the PNC record.

STRATEGIC OBJECTIVE 4: - continued



Sample collection and submission by the police

Subject samples

The new PACE sampling kits (see page 11) are being introduced alongside improved processes by the police for taking the samples. These include ensuring the identity of the subject, where possible by checking fingerprints against IDENT 1, and referring to PNC to check if a sample has been taken previously from the subject. This will reduce instances of use of aliases and unnecessary re-sampling.

The new PACE sampling kits will also produce further efficiency savings, in terms of cost and time, as all samples taken with the new kits will be processed in compliance with the Criminal Justice System requirements for maintenance of sample integrity and continuity. This will simplify the sampling procedures and allow the police to decide at a later stage than previously whether the DNA sample is required for intelligence purposes only or for use in evidence. As all samples taken with the new kit will be processed to evidential standard, there will also be no need for a separate sample to be obtained from the subject later, following a Database match, for use in evidence.

Crime scene samples

There were 913,717 crime scene visits in 2004/2005. However, scene examinations are carried out in respect of only 16.25% of all recorded crime as many types of crime such as street robbery, shoplifting and fraud do not have an obvious crime scene and crime scene examination is not possible or required. DNA profiles are currently successfully loaded to The National DNA Database from 5% of the crime scenes examined. In order to improve the use and effectiveness of The National DNA Database it is essential to increase the number of crime scenes visited and the number of crimes from which DNA is recovered and loaded to the Database.

DNA profiling receives greatest publicity where it helps to solve serious crime. However, it also plays a very important part in helping detect offenders for less serious crimes. The funding provided by the Home Office DNA Expansion Programme helped increase the proportion of active offenders on The National DNA Database (see page 10). It also provided funding to enable the retrieval of more trace DNA material left by offenders at crime scenes, particularly volume crime scenes (burglary and vehicle crime) where police clear-up rates were traditionally lower.

The Home Office DNA Expansion Programme

Approximately £15m of the funding provided by the Home Office DNA Expansion Programme from 2001/02 to 2004/05 was allocated to 'support costs', to cover the employment of between 600 and 650 additional forensic staff (14% of all forensic staff) vehicles and equipment for forces in England and Wales, and enable the police to attend more crime scenes. This increase in funding led to a rise in the number of crime scenes visited, from 904,560 in 1999/2000 to 982,592 in 2001/2002; 998,205 in 2002/2003; and 995,180 in 2003/2004 (an increase of over 90,000 visits per annum, or 9.1%, between 1999/2000 and 2003/2004; and 913,717 visits in 2004/2005. The decrease in 2004/2005 may be largely explained by the 7% fall in recorded crime between 2003/2004 and 2004/2005).

This resulted in a year on year increase in the number of crimes where DNA samples were retrieved from crime scenes, from 62,693 in 2000/2001 to 109,051 by 2004/2005, a total rise of 71% over the 5 year period. There was an equivalent 73% increase, from 47,597 to 82,345, in the number of crime scene samples submitted to the supplier laboratories.

The number of profiles submitted by the supplier laboratories for loading to The National DNA Database from forces in England and Wales rose from 37,750 in 2000/2001 to a peak of 56,622 in 2002/2003 (a 49% increase over 2000-2001), before falling to 47,783 in 2003/2004 and then rising slightly again to 48,019 crimes in 2004/2005.

Work is under way within the joint Home Office/ACPO Forensic Performance Group to try to understand why, although the number of DNA samples recovered from crime scenes and submitted for analysis continued to rise between 2002/2003 and 2004/2005, the number of profiles loaded to The National DNA Database fell by 16% in 2003/2004 before rising again in 2004/2005.

STRATEGIC OBJECTIVE 4: - continued

Submission of information by the police to suppliers and The National DNA Database

Subject samples

The police provide full details to the supplier laboratories on the forms provided with the sampling kits for all subject samples they take. For samples taken under PACE, the police also create a record on PNC, uniquely identified by the kit bar code number and the PNC-generated Arrest Summons Number, and this in turn leads to a stub record for the sample being automatically created on The National DNA Database via the PNC/National DNA Database link, obviating the need for suppliers to provide the Database with this information for this type of sample. For Scottish samples and volunteer samples, the supplier laboratories provide the sampling kit bar code number and the requisite sample details to The National DNA Database at the same time as submitting the DNA profile.

The recording of data on the forms in the sample kits, the inputting of data to PNC and the preparation of electronic files for submitting data to The National DNA Database by suppliers involve manual processes and are potential sources of error. There is a particular risk with transferring details of the kit bar code number, which contains 8 digits, and the Arrest Summons Number generated by PNC, which has up to 20 alphanumeric characters. The police are taking steps to eliminate these risks by developing new procedures through the NSPIS Custody IT system. This will involve the use of bar code scanning to enter the kit bar code number onto PNC, and hence The National DNA Database, and automatically printing the Arrest Summons Number generated by PNC onto the form that will accompany the sample submission to the supplier laboratory for analysis. This enhancement to NSPIS Custody will be rolled out during 2005/2006.

The link between The National DNA Database and PNC, that came live in 2001, has provided the police with the capability of identifying through PNC whether a profile for a specific subject is already on the Database, and thus whether there is a need for a DNA sample to be taken. This has led to significant financial saving through avoiding unnecessary repeat sampling and analysis.

At present, there is no equivalent link to the Scottish police computer system, although such a link is planned as part of the next steps in DNA Database IT development. Similarly, it is hoped that a link to the Northern Ireland PNC can be achieved following on from the initiative to load DNA profiles from samples taken from subjects in Northern Ireland to The National DNA Database.

Crime scene samples

Crime scene samples are submitted to supplier laboratories for analysis together with sample identification details in a variety of different ways. They are uniquely identified by means of a bar code number allocated by the supplier laboratory on receipt of the sample for analysis.

Developments in laboratory services

The supplier laboratories can improve the use and effectiveness of The National DNA Database by ensuring the reliability of the DNA profiles they produce, improving the success rates for their analyses, carrying out their work at lower cost and delivering their analytical results more quickly.

Reliability

All supplier laboratories have made great strides in reducing the human element in DNA profiling through increased use of automation and expert systems to generate the profiles, and expert systems and elimination databases to detect and deal with contamination.

Automation and expert systems

No supplier has yet automated their entire analytical processes, but the majority have introduced a modular approach in which robots have replaced manual involvement in a number of the key stages. These robots carry out sample logging/batching of samples, extraction of DNA, amplification of DNA and preparation for electrophoresis. Manual intervention is only required to transfer sample plates between the processes and/or robotic workstations, or in and out of storage. The automation of these processes means that the samples are no longer handled in individual tubes, but as batches on 96-well sample plates, each sample and plate having a unique identifying number through which their progress can be tracked via the supplier's laboratory information management system (LIMS).

Expert system interpretation packages have been used by supplier laboratories for some time to manipulate data for standard single source profiles (e.g. subject samples), but they are now being used increasingly to interpret the more complex results generated from crime scene samples, where the profiles obtained often include DNA components from two or more individuals. Previously, this work involved much manual intervention and although data were processed by software packages the scientists were still required to review and validate the interpretation before it could be accepted. The latest advances in these software developments have made them more sophisticated in terms of the rules they apply, with the result that only the occasional result is now referred to the scientist for review.

Managing the contamination risk

With the very high sensitivity of SGM Plus®, great care is required to minimise the risk of introducing extraneous DNA that did not originate from the offender, but came from other persons who have had access to the samples collected, from other samples, from the equipment and materials used to collect and analyse the samples or from the environment generally. Measures are also required to allow such contamination to be detected if it cannot be prevented. These are integral parts of the quality requirements for the supplier laboratories and are routinely audited by UKAS when they carry out their inspections.

The Custodian and suppliers provide advice to police personnel on how to avoid contamination and have combined to help produce a best practice manual for ACPO on the "Avoidance of Contamination in the Recovery, Packaging and Submission of Material for DNA Analysis". The FSS have also offered an environmental monitoring service to forces for medical examination suites and custody suites where DNA samples are taken to encourage best practice and improve these areas for victims, suspects and police officers. The service has been developed as a consequence of a report by Her Majesty's Inspectorate of Constabulary, which highlighted the potential for DNA contamination in such facilities. The FSS has examined more than 30 rape examination facilities across the UK over the last two years, concluding they could benefit substantially from adopting the service.

The risk of contamination in the laboratories is reduced, for example, by adhering to strict sample handling procedures, automation of analyses, wearing appropriate protective clothing, controlling the airflow in laboratories and restricting the movement of staff and equipment to designated work areas. In addition, suppliers carry out environmental

STRATEGIC OBJECTIVE 4: - continued

monitoring of laboratory areas to monitor the effectiveness of laboratory cleaning and identify the levels of extraneous background DNA.

The identification of contamination when it does occur is more difficult for crime scene samples than subject samples, but in both cases it is facilitated by reference to 'contamination elimination databases'.

One of these elimination databases is held by the Custodian and contains the profiles of around 80,000 front line police personnel who could come into contact with samples collected from subjects and crime scenes. The supplier laboratories can request a check against this police elimination database, however, only where it is suspected by the senior investigating officer or scientific support manager that contamination in a specific case may have occurred. As of 31st March 2005, 787 individuals on the Police Elimination Database (PED) have been nominated for checking of their profiles against profiles from 216 scenes. These searches of the PED resulted in full matches being identified at 44 of the scenes, thereby closing down unnecessary lines of enquiry in police investigation of the crimes involved.

Other elimination databases are held by individual suppliers and contain DNA profiles of the staff employed in the laboratories, regular visitors to the laboratories and contractors; profiles from the staff employed in the companies manufacturing the consumables used in the DNA analysis process; unsourced profiles from negative controls; and profiles previously demonstrated to have arisen as a consequence of contamination. Suppliers have also developed automated systems for checking all the profiles they produce from subject and crime scene samples against these databases, and for checking for cross-contamination during the handling of the sample in the laboratory, as a routine part of the analysis process.

The need for the database of profiles from the staff employed by the manufacturers of consumables arose out of a murder investigation in which unexpected links had been established by the FSS between several otherwise unrelated offences through DNA, which were eventually demonstrated to be contamination from someone employed in the manufacture of one of the consumables used in analysis. But it is seen only as an interim measure. The longer term solution has to be in post-production treatment of the consumables by the manufacturers to eliminate any extraneous DNA before they are despatched to the laboratories. The FSS has developed an approach to achieve this which has been shown to be very effective (process subject to patent).

The negative control data collected by suppliers can now also be used to provide not only an indication of the DNA contamination level in the supplier environment but also for setting threshold levels for the interpretation of DNA profiles.

Success rates

Subject samples are usually of good quality and can be analysed with a high degree of success, even using the highly standardised approaches developed for high throughput systems.

Crime scene samples are more difficult to analyse. They are often in poorer condition, sometimes part-degraded because of the conditions at the crime scene. Also, the samples may be contaminated by materials that can adversely affect the efficiency of the analysis process. On average, approximately half of all crime scene samples yield either no DNA profile at all or a partial profile, although there is a wide variation in success rates depending on the type of sample involved. Where the extraction process is specifically tailored to the type of sample and substrate the success rate can be significantly improved.

Low copy number DNA analysis

If the DNA present in a crime scene sample is very low in amount or degraded (i.e. at low copy number), the standard SGM Plus® profiling methodology will often fail to produce a DNA profile, or a very partial one. There is a greater chance of success if the target DNA is amplified further (usually increasing the number of amplification cycles from 28 to 34). This will also result in any contaminants present in the sample or introduced during the analysis process being increased in quantity, making interpretation of the results more difficult. To account for this, each sample is analysed in duplicate and special interpretation rules are applied.

Low copy number DNA analysis has proved most useful in cold case reviews where biological material that was not successfully profiled at the time of the original offence has been preserved (see page 22 & 28).

Obtaining constituent crime scene sample profiles from mixtures

Crime scene sample profiles often contain contributions from more than one individual. The situation has been exacerbated as the sensitivity of the profiling techniques has increased.

Where there is a large difference in the relative proportions of the components of the mixture it is possible to identify the individual constituent DNA profiles with some certainty and to load them to The National DNA Database. Some suppliers have expert systems available to help with this. If the DNA profile is less certain, a 'best guess' of what it might be can still be speculatively searched against the Database without actually loading the profile.

Where the components of the mixture are more even in contribution, there was previously nothing the scientist could do with them, but the FSS have now developed another application, Pendulum List Search (PLS), that will provide a list of all possible pairs of DNA profiles that could combine to produce the mixed profile. These are prioritised on the basis of their likelihood of occurrence and then each is speculatively searched by the Custodian against The National DNA Database for matches.

48 hour result

Early one Sunday morning, a young woman was disturbed by a man who had managed to enter her home through an open downstairs window. The woman was subjected to a vicious and violent rape. A knife was held to the victim's face throughout the ordeal. Police initially identified seven possible suspects but had no firm lead. The incident was broadcast widely in the press and on TV and officers made appeals for people in the area to keep windows securely locked in the warm weather. Two other women came forward to report that a man had also entered their homes on the same weekend in the same housing estate. Both women managed to fend off the attacker.

Police were concerned that they had an active rapist at large and were heavily reliant on the results of forensic tests from various swabs and items of clothing. Within 48 hours, a small trace of semen had been examined and a mixed DNA profile obtained. Once the profile of the victim was removed from this, a partial male profile remained. The quality of the profile was not good enough for loading to The National DNA Database, but it was sufficient for a one-off speculative search to be carried out. This had the potential to produce numerous matches, so the search was restricted on the basis of the age and ethnic appearance of the offender as described by the victim.

Two possible suspects were identified by this process, one of whom lived in the street next to the rape scene. On the basis of this information, the police requested a comparison of fingerprints found at the scene with the fingerprints of this suspect which were held on record and discovered that they matched. The suspect was immediately arrested.

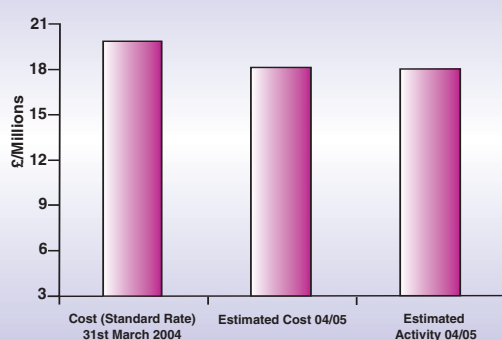
Further work on the mixed profile in the laboratory resulted in the second suspect from the one-off speculative search of the Database being eliminated and a match probability being established of approximately one in 37 million in respect of the first suspect. The arrest was carried out within three days of the offence and within two days of the evidence being submitted to the laboratory.

STRATEGIC OBJECTIVE 4: - continued

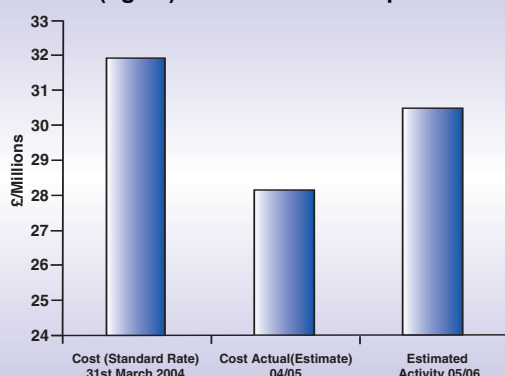
Costs

The funding made available to forces by the DNA Expansion Programme towards meeting the cost of profiling samples has led to a huge expansion in supplier laboratory business and their revenues. The increased revenues have enabled the suppliers to fund automation of analysis, speed up the processing of both subject and crime scene samples and reduce the unit costs of processing. Figures 13 and 14 show the impact on national total sampling costs between 2004/2005 and 2005/2006: the 2003/2004 standard sampling rate (i.e. before cost reductions); the impact of cost reductions in 2004/2005 (based on implementation of cost reductions after 31 January 2005), and the anticipated spend in 2005/2006 (based on the 2004/2005 outturn sampling activity).

(fig 13) CJ Samples



(fig 14) Crime Scene Samples



Faster delivery

The automation of DNA sample analysis and profiling has enabled suppliers to speed up the processing of both subject and crime scene samples. The average time to process a subject sample from receipt to submission of a profile for loading on the Database is now around 5 days, and for crime scene samples around 10-12 days.

Developments are also under way to enable the analysis of samples to be carried out nearer the scene of crime, rather than having to transport the samples to the laboratory.

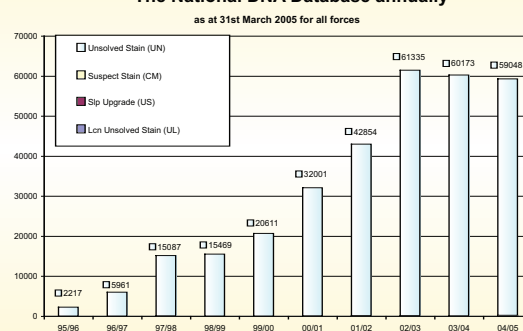
The National DNA Database: crime scene sample profile statistics

Crime scene sample profiles retained on The National DNA Database

On 31 March 2005, 232,343 crime scene sample profiles were retained on The National DNA Database. Some 59,048 of these were added during 2004/2005, 98% of the total added in 2003/2004.

Crime scene sample records on The National DNA Database contain details of the unique identification number, the offence code, the sampling force and the laboratory to which the sample was submitted, the sample type and the test type.

(fig 15) Number of SOC Sample DNA Profiles loaded to The National DNA Database annually



Between 1995 and 2000, the number of crime scene profiles on the NDNAD rose from zero to 65,000. These were obtained mainly from serious violent crimes and sex crimes, and from less serious property crimes where force budgets permitted.

The more than doubling of the number of crime scene sample profiles successfully added annually to The National DNA Database, from around 25,000 in 1999/2000, to 53,235 in 2001/2002, 65,649 in 2002/2003 and 60,155 in 2003/2004, was a direct result of the increase in the number of volume crime scenes attended (in England and Wales) by forensic staff funded by the Home Office DNA Expansion Programme.

All DNA profiles from crime scene samples for which no match has been found on the Scottish DNA Database are also added to The National DNA Database.

It is anticipated that FSNi will gain accreditation for the upload of new crime scene sample profiles to The National DNA Database during 2005/2006.

Crime scene sample profiles by type of analysis

At 31 March 2005, 38,424 (17%) of the crime scene sample profiles on The National DNA Database were SGM profiles and 192,114 (83%) were SGM Plus® profiles. The police are encouraged to upgrade all SGM profiles from crime scene samples that are involved in matches with subject sample profiles before taking any further action. 532 (0.23%) of crime scene sample records on The National DNA Database have both SGM and SGM Plus® profiles.

STRATEGIC OBJECTIVE 4: - continued

Crime scene samples by level of partiality

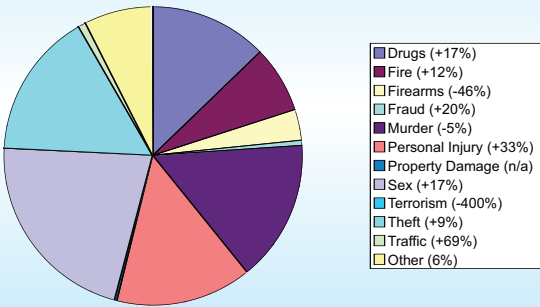
Unlike subject sample profiles, crime scene sample profiles on The National DNA Database can be full or partial ones. This reflects the increased difficulty in analysing crime scene material. But for loading to The National DNA Database the profile must contain a minimum of 8 of the SGM Plus® markers to avoid slowing down the speculative search process and obtaining large numbers of potential matches which would in most cases provide intelligence information of little value.

Crime scene sample profiles by type of offence

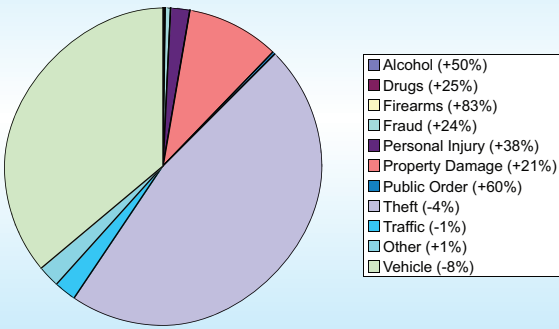
As at 31 March 2005, about 88% of the crime scene sample records on the Database related to volume crime offences and 8% to serious crime offences. The type of offence is not recorded for the remainder.

A breakdown of the types of offence for which the samples were taken is provided in figures 16 and 17.

(fig 16) Serious crime offence profiles loaded to The National DNA Database during 2004/05
(figures in brackets are changed on 2003/04)



(fig 17) Volume crime offence profiles loaded to The National DNA Database during 2004/05
(figures in brackets are changed on 2003/04)



Operation Advance

A study carried out by the FSS in February 2004 on behalf of the Home Office Police Standards Unit estimated there were 215 old cases which had been analysed using the Single Locus Probe [SLP] technology in use before development of The National DNA Database that remained undetected and for which there was crime stain material still available. Of these, over 90% were serious sexual assaults. In July 2004, the Home Office provided £375,000 to the FSS for Operation Advance, a joint

initiative with 22 forces across England and Wales, aimed at using new and advanced forensic techniques to obtain SGM Plus® DNA profiles from the preserved evidence. From 148 of these cases selected for further work, 112 [73%] provided a DNA profile for addition to The National DNA Database.

The Home Office have since committed a further £316,000 to a second phase of Operation Advance involving a further 236 cases of serious crime committed between 1994 and 1995. Over 95% of these cases involve stranger rape or serious sexual offences.

Crime scene sample profiles removed from The National DNA Database

Since 1995, 91,027 crime scene profiles have been removed from The National DNA Database at the request of the police.

National DNA Database match statistics

Subject to subject matches

Matches between subject samples can indicate replicate sampling [including possible use of an alias] or two different individuals sharing the same profile [see pages 8 & 9].

Crime scene to subject matches

Matches between a crime scene and a subject are useful in identifying possible suspects for the offence. Since May 2001, 195,779 crime scene profiles have been matched with 157,096 separate individuals.

For 126,883 of the crime scene profiles, a single suspect was reported. For the remainder, a list of potential suspects was produced. The identification of more than one potential suspect as the source of the DNA at some scenes is largely due to the significant proportion of crime scene sample profiles that are partial.

For 2004/2005, one or more subject sample profiles were matched with 40,169 crimes. The total represents 89% of the number of crimes for which one or more suspects were nominated in the previous year. The reason for the fall is due to fewer new crime scene sample records being loaded within the period.

Over the course of the DNA Expansion Programme there has been an almost doubling of the number of crime scene samples per year for which one or more suspects have been identified.

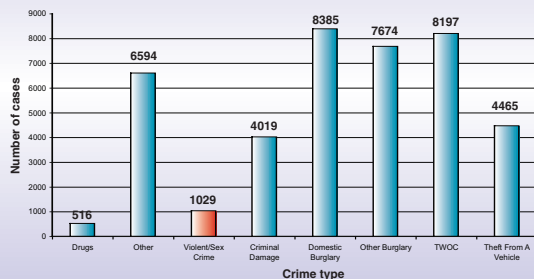
	1998/99	1999/2000	2000/01	2001/02	2002/03	2003/04	2004/05
DNA Matches	21,239	23,021	30,894	39,043	49,913	45,269	40,169

The number of crimes with DNA matches rose from 23,021 in 1999-2000 to a peak of 49,913 in 2002/2003 [a 74% increase] before falling to 45,269 in 2003/2004 and then to 40,169 in 2004/2005. The fall in DNA matches after 2002/2003 broadly correlates with the fall in the total number of recorded crimes over the same time frame [i.e. fewer crimes, fewer crime scenes being visited, and fewer crime scene sample DNA profiles being loaded, leading to fewer matches].

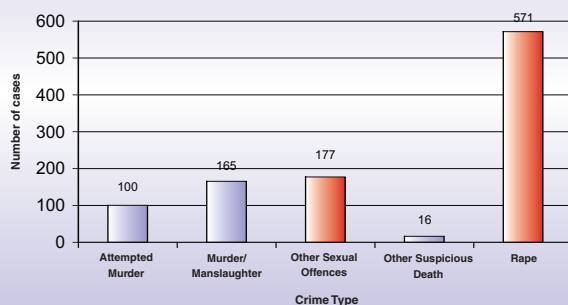
STRATEGIC OBJECTIVE 4: - continued

Matches by type of offence

(fig 18) Number of cases which have been linked to one or more subjects in 2004/05



(fig 19) Number of violent/sexual offence cases that have been linked to one or more subjects in 2004/05



Matches involving profiles retained under the Criminal Justice and Police Act 2001

Since 2001, approximately 10,754 crime scene samples have been matched with over 7,591 separate potential offenders whose profiles would have been removed under the legislation prior to the Criminal Justice and Police Act 2001. These represent about 3% of the estimated 221,000 separate individuals whose profiles have been retained as a result of the change in the law and relate to 88 murders, 45 attempted murders, 116 rapes, 62 other sexual offences, 91 aggravated burglaries, 94 the supply of controlled drugs and a number of serious assaults.

From research carried out in July 2004, it is estimated that for 22% [62,000] of these retained records, another DNA profile has been obtained subsequently and added to The National DNA Database, indicating that there has been a further incidence where the individual, whose record was initially retained despite being acquitted or not prosecuted for the relevant offence, has since been arrested, charged or reported for summons in relation to another offence. This does not necessarily equate to 22% of individuals, as there may be some replicate sampling.

Matches involving profiles from volunteers

For technical reasons, it was not possible to load volunteer profiles to The National DNA Database as soon as this was permitted by legislation, so they were held on a spreadsheet and manual one-off speculative searches were commenced. This was a labour intensive and slow process. By August 2004 some 11,405 volunteer sample records were stored but relatively few searches had been conducted.

In August 2004, all of these profiles were then submitted for loading to The National DNA Database and 9,329 records (82%) loaded successfully producing 210 matches with crime scene sample profiles. Of these, 83 were first time matches to previously undetected crime scenes (see the table below for a breakdown of the offences).

Offence	No. of Matches
Murder/Manslaughter	3
Attempted Murder	1
Rape	3
Other Sexual Offences	1
Robbery Serious	2
Abduction and Kidnapping	1
Aggravated Burglary	1
Less Serious Assault	2
Criminal Damage	8
Traffic Offences Non-Fatal	1
Burglary in a Dwelling	16
Robbery Volume	1
Other Burglary	19
Auto-Crime	4
Theft of a Vehicle	16
Theft From a Vehicle	3
Other Vehicle Crime	1
Total	83

The remaining 127 matches were to crime scene sample profiles for which matches had been reported previously as a result of the volunteer already having a profile on The National DNA Database. The Best Practice guidelines have been amended to recommend that the police perform a PNC check for whether there is already a profile on The National DNA Database, before a volunteer is requested to provide a sample for elimination purposes, to help minimise any redundant re-sampling.

The remaining 2,076 records failed to load due mainly to the profiles being partial or the demographic information being incorrect. These are being investigated further.

Matches involving profiles from arrestees

A software development has been proposed to PITO which will identify those records on The National DNA Database relating to arrestees who are not subsequently charged. At present, no date has been agreed for delivery of this change.

STRATEGIC OBJECTIVE 4: - continued

Matches involving profiles from prisoners

When the 3,800 profiles from the Prisoner Sampling Programme were added to The National DNA Database, matches were obtained linking 200 prisoners to 300 unsolved crimes.

The DNA matches from the Prisoner Sampling Programme related to a whole range of offences from rape to burglary. The most significant was the 1997 murder of a 12-year old girl in London. The offender, a Polish national, wanted for serious sex offences in Poland, committed a burglary and found a young girl alone in the house. He murdered her and was disturbed when her father returned to the house. The offender was chased and escaped when he hijacked a passing car. He was identified from the DNA of a head hair found on her jumper and is now serving a life sentence.

Matches involving profiles from Operation Advance

On searching 77 of the profiles from the 112 that gave a DNA profile against the Database, 42 provided matches with a named individual or another crime scene sample, a success rate of 28%. Eight offenders have now been convicted with sentences totalling almost 60 years. Twelve further offenders have been arrested and are awaiting trial.

20 of the cases that provided a profile but failed to produce a match on the Database have now been selected for familial searching.

Crime to subject match rate

The likelihood of useful information being obtained when a sample profile is loaded to The National DNA Database is difficult to assess. However, one measure we use is the 'crime to subject' match rate, the proportion of profiles loaded that immediately identifies one or more potential suspects for a crime for which no other suspects have been previously identified through the Database.

When performing this calculation, we have to recognise that The National DNA Database is dynamic and constantly changing in size, with over 1,500 subject sample and over 150 undetected crime scene sample profiles being loaded every day whilst at the same time "detected" crime scene sample and redundant subject sample profile records are being removed. This makes it extremely difficult to calculate the opportunity which a sample profile has had on a given daily load date to create a new undetected 'crime to subject' match.

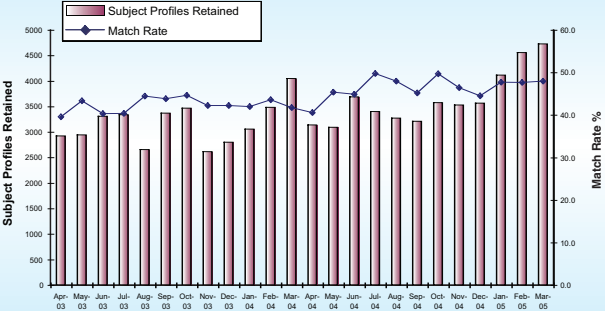
This opportunity for a first 'crime to subject' match can occur following the loading of a crime scene sample profile (see [a] below) or a subject sample profile (see [b] below).

[fig 20]

The 'crime to subject' match rate following the loading of a crime scene sample profile is calculated as the number of matches obtained in a specified period (the financial year) that occurred immediately when a crime scene sample profile was loaded on The National DNA Database divided by the number of crime scene sample profiles loaded in the same period.

[Strictly speaking, the denominator should relate to crimes, but The National DNA Database does not record crimes, only profiles. On average, it is estimated that there are 1.2 different crime scene sample profiles loaded per offence].

(fig 20) Crime to subject match rate following addition of a crime scene sample profile April 2003 - March 2005



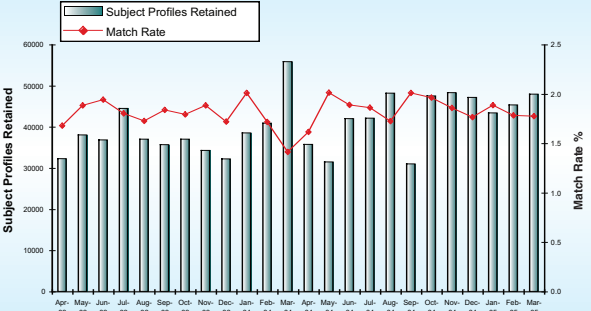
The average match rate for 2003/2004 was 42.3%; in 2004/2005 it rose to 46.5%.

The match rates quoted in the Annual Report for 2003/2004 were slightly elevated because there was an element of over-counting by including matches with replicate profiles from the same person. These match rates have been re-calculated for comparison purposes in this year's Report.

[fig 21]

The 'crime to subject' match rate following the loading of a subject sample profile is calculated as the number of matches obtained in the specified period when a subject sample is loaded to The National DNA Database divided by the number of subject profiles loaded in the same specified period.

(fig 21) Crime to subject match rate following addition of a subject sample profile April 2003 - March 2005



The average match rate for 2003/2004 was 1.77%; in 2004/2005 it slightly increased to 1.84%.

The submission rates for subject sample profiles increased by some 9% in 2004/2005 over the previous financial year, whilst the submission rates for crime scene sample profiles have been fairly constant. The chance of identifying a suspect on the Database following the loading of a new crime scene sample profile has increased steadily from 40% in April 2003 to 48% by March 2005. The chance of identifying a match with an undetected crime scene sample profile following the loading of a new subject sample profile has not significantly changed. This would appear to indicate that there is a notable benefit to be gained from loading more subject sample profiles to the Database – a key objective of the DNA Expansion Programme.

STRATEGIC OBJECTIVE 4: - continued

Crime scene to crime scene matches

Matches between DNA profiles from samples from different scenes of crime provide valuable intelligence information which the police can use alongside other forms of intelligence (e.g. fingerprints, shoemarks, toolmarks, firearms data) to establish the pattern of offending. Once the offender is subsequently identified for one of the offences, the scene to scene matches assist greatly in helping to clear up the further ones.

In 2004/2005, 4,500 new crime scene sample profiles were linked to existing crime scene sample profiles for which no suspect had been identified to forces in match reports from The National DNA Database.

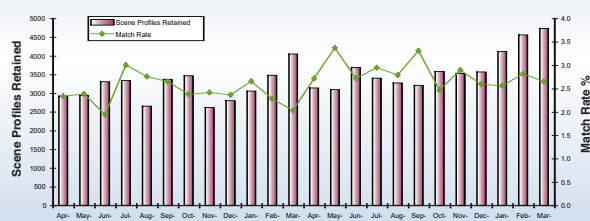
	1998/99	1999/2000	2000/01	2001/02	2002/03	2003/04	2004/05
Crime scene to crime scene matches*	270	439	764	2,769	3,258	2,816	4,349

* These figures relate to crime scenes linked to crime scenes, as opposed to crime scene sample profiles linked to other crime scene sample profiles referred to in the preceding paragraph, the 4,349 for 2004/05 being lower than the 4,500 as a result of multiple crime scene sample profiles being submitted from some scenes.

Crime to crime match rate

The 'crime to crime' match rate is calculated as the number of new crime scene sample profiles loaded to The National DNA Database that immediately match one or more crime scene sample profiles already on the Database, divided by the number of crime scene sample profiles loaded in the same specified period.

(fig 22) Crime to crime match rate
April 2003 - March 2005



The average crime to crime match rate for 2003/2004 was 1.52%; in 2004/2005 it rose to 2.07%.

The table below shows, as at 31 March 2005, the number of linked crime scenes (match groups) and the number of crime scene sample profiles that are contained in each linked series. The vast majority indicate only a limited incidence of repeat offending, but there are instances also where prolific offending is demonstrated.

No. of Crime Scene Sample Profiles in the Match Group	No. of Scene to Scene Match Groups *
2	3758
3	289
4	65
5	23
6	13
7	8
8	3
9	3
10	7
11	1
12	1
16	1
17	1
40	1
58	1

* The number of scene to scene match groups totals 4,174. It reflects the state of The National DNA Database at a point in time and will not include any match groups which have been deleted.

Matches involving profiles from Scottish samples

Scene to subject matches

In 2004/2005, 2,771 DNA match reports identifying suspects for offences were issued from the Scottish DNA database. Most of these offences related to volume crime, but a total of 841 of the speculative searches resulted in 366 matches for serious crime, including murder, rape, child abuse and robbery.

Match rates

The probability of identifying a possible suspect for an offence when a new crime scene sample profile is first added to the database has continued at an average of 70% each month.

Matches following addition of Scottish crime scene sample profiles to The National DNA Database

Accurate data is not available on the number of additional matches obtained from addition of Scottish crime scene sample profiles to The National DNA Database. However, it is clear that the number is low, as would be anticipated given the match rate of around 70% on the Scottish DNA Database. A survey in 2003 of Scottish Forces indicated that an additional 17 matches were obtained.

Scene to scene matches

The number of scene to scene matches reported by the Scottish DNA Database during 2004/2005 was 86.

STRATEGIC OBJECTIVE 4: - continued

Database services

Key performance indicators

The performance of the Custodian in providing Database services during 2004/05 was monitored by The National DNA Database Board against three key performance indicators, as detailed in the table below.

Performance Indicator

1

All DNA profiles for The National DNA Database and Police Elimination Database will be loaded within 24 working hours of their receipt by the Custodian

2004/05 Quarter Target reached for	Q1	Q2	Q3	Q4	
Number of profiles	133,342	148,454	175,040	168,243	
%	94.4	98.3	99.1	98.6	

Performance Indicator

2

- a) 90% of DNA match reports (all case types) will be dispatched within 1 working day of loading the relevant profile to The National DNA Database
- b) The remaining 10% of matches will be dispatched within 3 working days
- c) All match reports involving violent crime cases will be dispatched on the same working day that the match is identified and Police Elimination Database will be loaded within 24 working hours of their receipt by the Custodian

2004/05 Quarter	Q1	Q2	Q3	Q4	
a) % matches reported within 1 working day	100	100	100	100	
b) time to report remaining matches	n/a	n/a	n/a	n/a	
c) % match reports in violent crime cases dispatched on same day	100 (1210 match reports)	100 (1367 match reports)	100 (1435 match reports)	100 (1583 match reports)	

Performance Indicator

3

Following verification of the DNA match, should one or more of the DNA profiles involved in the match differ from that originally reported; an elimination report will be issued within 1 working day of receipt of the verification result.

2004/05 Quarter	Q1	Q2	Q3	Q4	
Number of elimination reports dispatched within 1 working day	138 out of 423	461 out of 800	348 out of 717	198 out of 553	
Time up to dispatch of the remaining elimination reports.	2 to 20 days	2 to 10 days	2 to 20 days	2 to 20 days	

National DNA Database service performance 2004/05

These performance indicators are currently under review. It is expected that they will be replaced during the next year by a more comprehensive suite of measures in line with the future contract requirements for Database service provision.

STRATEGIC OBJECTIVE 4: - continued

National DNA Database IT Development Programme

The Custodian has continued to work closely with the FSS Information Services Department in developing the IT systems associated with the Database and improving the software for the delivery of Custodian services and management information. As in the previous three years, this work has been funded through the Home Office DNA Expansion Programme, with a further £1.2 million having been made available in 2004/2005.

A number of important projects within the Home Office funded National DNA Database IT development programme have come to fruition during 2004/2005:

Electronic delivery of DNA match reports

The automated delivery of DNA match reports (eDNA) to police forces in England and Wales is part of the programme of improvements for more efficient and secure end-to-end processing of data by the Custodian.

The eDNA service has been designed to use industry standard architecture to post match reports in an XML (Extended Mark up Language) format via a secure Web service interface. Each force can then use a client application to poll the Web service and collect its own match reports, and send a receipt message advising of success or failure in transmission that automatically updates records on The National DNA Database.

The eDNA service was launched in September 2003 as a pilot with the West Midlands Police and ran through to January 2005. It successfully delivered over 120,000 match reports without error. A fully operational eDNA Match Report service is now due to be implemented in May 2005. Initially, this will be with two forces, South Yorkshire Police and the West Midlands Police. The Custodian and the Police Standards Unit will then work with other forces and IT Suppliers to expedite implementation of this new service in a way that meets individual force requirements.

The new eDNA service will greatly speed up the delivery of DNA match reports to forces from The National DNA Database. It will also significantly reduce the amount of paper used and remove some of the distribution errors associated with the previous manual system of faxing match reports. Forces will also be able to feed the DNA match information directly into their own force intelligence systems, thus eliminating the requirement to re-key data, and they will be able more easily to re-structure the data to prepare pertinent management information for force managers.

Replicates repository

The 'replicates repository' has been developed as a means of grouping together all internally consistent matching profiles. Whenever a new subject sample profile is loaded to The National DNA Database, or a subject sample profile is upgraded on the Database, it is automatically compared with this repository. If the subject sample profile does not match any other subject profile in the repository, it is placed in a new group. If the subject sample profile is consistent with an existing subject sample profile group, it is added to that group. When a subject sample profile is removed from The National DNA Database, it is also automatically removed from the repository.

Matching profiles in a group in the repository are taken to be from the same person if the name is also the same. If the names are different, investigations are carried out to check

whether the profiles relate to the same person using a different name or to different persons. We have found no full SGM Plus® matches between unrelated individuals in the work done to date. However, by comparison of records between The National DNA Database and PNC, it has been possible to identify 1,050 hitherto unknown alias names, resulting in false or duplicate entries on PNC; 498 sets of criminal twins; and 2 sets of criminal triplets.

Speculative searching of The National DNA Database

As each new subject or crime scene sample profile is added to The National DNA Database it is checked against all other subject and crime scene sample profiles on the Database. Any that are compatible are identified as a match.

The speculative search algorithm currently in use was developed for use with SGM profiles. It uses a primary search string of the three most discriminating SGM markers (FGA, D21 and D18) to create a subset of matching profiles which are then re-searched against the whole Database for matches using the full profile information. Proposals have been made by the Custodian for the development of a new speculative search program that would provide for more efficient searching of the Database, which now contains mainly SGM Plus® profiles, and would also accommodate searching against any additional markers that may be included in the future [see page 35]. It would also speed up the process where partial profiles are involved and allow for non-exact matches, such as those obtained in the quality check for matches at all but one marker and those obtained in familial searches, to be incorporated into the core search algorithm.

Scottish Cases

A security guard within a Fife retail outlet observed a male suspect stealing articles within the store. When challenged as he left the store, the suspect lashed out at the guard striking him repeatedly with a knife. The guard suffered injuries to his mouth, wrist, and arm along with a stab wound to his abdomen. During the struggle the suspect lost his baseball cap. This was recovered by the Police who attended the scene and submitted to the forensic laboratory. A male DNA profile was obtained from this cap which matched a profile on the Scottish database. The suspect was arrested and charged with attempted murder.

A female Tayside householder investigating the sound of breaking glass in her home discovered a male with a woollen hat wrapped round his hands removing shards of glass from a window he had broken. The man ran off dropping his hat at the scene. Several strands of hair were discovered from the hat and from these a male profile was obtained. A suspect was subsequently identified following a database search, and was arrested and charged with housebreaking.

A series of housebreakings in Central Scotland were thought to be the work of the same individual, particularly as on some occasions the thief covered door peepholes with cigarette papers during the course of breaking in. The police recovered the papers and submitted them to the laboratory for examination. Traces of saliva were found analysis of these revealed the same DNA profile. Following a search of the database a man was arrested and charged with the crimes.

Some bus companies in Scotland have issued their drivers with swabbing kits for use on occasions when staff are abused and spat on by passengers. The staff take swabs of the spit themselves submit them for analysis. This has resulted in several DNA matches being obtained and the persons responsible being charged with assault and breach of the peace.

STRATEGIC OBJECTIVE 4: - continued

Agreement is also expected for further development of a web-based interface to the Database, allowing authorised users to initiate and receive the results of certain specified speculative searches direct whilst retaining control of the Database and access rights with the Custodian.

One-off speculative searches

For loading to The National DNA Database, a crime scene sample profile must have been obtained by an approved supplier laboratory and meet the minimum load criteria specified by the Custodian. If the profile does not meet this standard it can still be searched against a snapshot of the Database on a one-off basis without being loaded to the Database. Such searches are only usually requested by the police for profiles from serious crime where they may be prepared to deal with the large numbers of potential suspects that could be generated. A one-off speculative search can be repeated at intervals if required.

In 2004/05 2,319 one-off speculative searches against National DNA database were performed. This compares with 1,984 in 2003/2004 and 1,394 in the 2002/2003.

Familial searches

A one-off speculative search approach is also used for conducting familial searches of the Database to identify offenders through possible close relatives of an offender whose profile is not on the Database.

Such use of the Database is compliant with PACE and the Human Rights Act 1998. In the opinion of the Information Commissioner's Office it also complies with Schedules 2 and 3 of the Data Protection Act 1998, and would meet the requirements of the First Principle if the data are processed fairly and lawfully. However, they commented that such use of the data is intrusive and has the potential to raise embarrassing and awkward questions which may relate to sensitive issues unrelated to policing, such as paternity, which had not previously been in doubt. It was thus the Commissioner's view that the practice of using familial DNA searching should be restricted to the most serious cases. It must be likely to contribute substantially to the detection of the crime in question and intrusion to the individual should be kept to the minimum necessary to achieve this. The information provided to the police when interviewing relatives of potential suspects should then only be used in relation to the specific case under investigation and the information should be destroyed if it turns out not to be pertinent to the enquiry. The Commissioner was also concerned that no more personal data relating to one person should be disclosed to another person than is absolutely necessary for the investigation, unless such disclosure is unavoidable for the successful conclusion of the investigation and a decision has been taken that any adverse consequences disclosure may have are justified in all the circumstances. In view of this, familial searching is only used in conjunction with the Information Commissioner's advice. Furthermore, all the Commissioner's observations have been addressed by The National DNA Operations Group in developing a Best Practice Guide for the conduct of familial searches.

The Commissioner's final point was that when taking a sample, to ensure fair processing, it may be better to incorporate disclosure of the familial search to the individual as a potential new purpose for which the data may be used. This will be considered when the sampling guidelines are next reviewed.

International searches

This year, 149 profile search requests have been received through Interpol London from various countries, resulting in 21 profile matches being reported. Profiles searched against The National DNA Database are required to contain the seven European loci agreed by the ENSFI/EDNAP

working groups. The majority of the submitted profiles submitted for searching were primarily partial in nature and produced multiple matches. Hence, the submitting countries were requested to carry out further work using SGM Plus®, if possible, in order to improve the discriminating power of the profile for resubmission for a further search.

Elimination of suspects

The National DNA Database is a very powerful tool for eliminating individuals from suspicion if their DNA does not match with that found at the crime scene. A search of the Database for subjects whose profiles match the crime scene sample profile in question is thus also helpful in eliminating from further consideration all subjects whose profiles do not match.

Detection of crimes

A crime is said to have been detected when a suspect has been identified and there is sufficient evidence to charge that suspect with the crime. DNA evidence, particularly following an initial Database match, has become hugely important to the police as a source of crime detections.

The number of detections in England and Wales following a match on The National DNA Database has increased significantly as a result of the DNA Expansion Programme, from 8,612 in 1999/2000, peaking at 21,098 in 2002/2003 and then falling to 19,873 in 2004/2005, an overall rise of 131%.

	1998/99	1999/2000	2000/01	2001/02	2002/03	2003/04	2004/05
Detections following matches on the NDNAD	6,151	8,612	14,785	15,894	21,098	20,489	19,873

The figures show that there has been a decrease in the number of DNA detections (detections of crimes with DNA matches) since 2002/2003. Over the same period, Home Office statistics show that there has also been a fall in the number of recorded crimes. The figures in the table below show the fall in DNA detections between 2002/2003 and 2004/2005 against the recorded crime figures, and indicate that the decrease in DNA detections over the last 2 years reflects the fall in recorded crime over the same time frame. Between 2003/2004 and 2004/2005, recorded crime decreased by 7% and DNA detections showed a corresponding, but smaller, decrease of 3%.

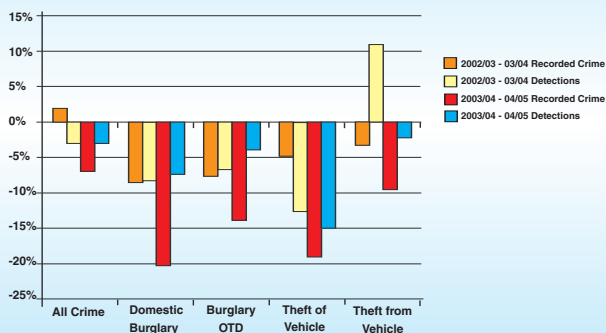
	2002/03	% Change	2003/04	% Change	2004/05
Recorded crime	5,920,156	2.1	6,042,991	-7	5,623,263
DNA detections	21,098	-2.9	20,489	-3	19,873

A similar analysis has also been undertaken of the recorded crime and DNA detection figures for the 4 volume crime types: domestic burglary, other burglary, and theft of and from vehicles. Figure 23 below shows the decrease in recorded crime and the decrease in DNA detections for these

STRATEGIC OBJECTIVE 4: - continued

areas. The number of domestic burglary crimes, for example, decreased by 8% between 2002/2003 and 2003/2004 and by 20% between 2003/2004 and 2004/2005, whilst DNA detections showed a corresponding decrease of 8% between 2002/2003 and 2003/2004, but only by 7% between 2003/2004 and 2004/2005. The figures for other burglary follow a similar pattern.

(fig 23) Percentage change between recorded crime and DNA detections 2002/03 & 2003/04-04/05



The number of 'DNA detections' is also likely to be understated. A research exercise carried out in 2002/2003 involved 'tracking' 95 DNA matches in 6 police forces, from receipt of match notification through to case closure. Of these, 58% were detected. This is significantly higher than the 42% of detections from 'DNA matches' reported by forces in 2002/2003.

On average, an initial detection from a DNA match also results in a further 0.8 crimes being solved, either as additional detections using other evidence or through TICs (cases taken into consideration). In 2001/2002, there were 15,894 directly DNA-related detections and a further 12,715 consequential detections, giving 28,609 detections in all. DNA is a thus powerful aid to crime investigation.

The contribution that DNA matches make to the investigation of crime is, however, best viewed in the context of the overall success that the police presently achieve in clearing up different forms of crime. In 2004/2005, there were 5,562,691 recorded crimes, of which 1,428,513 were detected, an overall detection rate of 26%, but where DNA was successfully recovered from a crime scene and loaded on to The National DNA Database the detection rate rose to 40%. Encouragingly, DNA is proving to be most helpful in those crimes that are more difficult to detect, domestic burglary for example, where the detection rate rises from the overall level of 16% to 41% where DNA is available.

CRIME CATEGORY	OVERALL DETECTION RATE 2004/05 (DETECTED CRIME AS A PERCENTAGE OF RECORDED CRIME)	DNA DETECTION RATE 2004/05 (DETECTIONS AS A PERCENTAGE OF CASES WHERE A DNA SCENE SAMPLE WAS LOADED TO THE NATIONAL DNA DATABASE)
All recorded crime	26%	40%
Domestic burglary	16%	41%
Burglary OTD	11%	50%
Theft of vehicle	15%	24%
Theft from vehicle	8%	63%
Criminal damage	14%	51%

Although having a very significant impact where it is used, The National DNA Database only features in about 0.8% of all criminal investigations. There are a relatively small number of crime scenes from which DNA samples can be recovered, and even where it could be recovered it may not be relevant (e.g. DNA is of very little value where the identity of the suspect is not in doubt and the issue is otherwise, such as alleged consensual intercourse or rape).

Operation Alveston

In 1992, an 18 year-old female was walking along a footpath when a male approached and indecently assaulted her. In 1997, a 12 year-old girl was walking through a subway when a male approached her and subjected her to a serious sexual assault. Both victims gave a similar description of the offender to the police and full DNA profiles were obtained in both cases from stains left by the offender. When the DNA profile from the second offence was loaded to The National DNA Database it was found to match that from the first. However, there was no match of this profile with any nominal profile on the Database.

The two cases were subsequently reviewed as part of Operation Alveston, an initiative by Hampshire Police looking at unsolved sexual offences dating back to the 1980s. There was still no match with any profile on The National DNA Database at this time, so in May 2004 the enquiry team requested a familial search of the profile against the Database. This produced a list of potential relatives of the offender. Using other information about the ethnic appearance and age of the offender from the victims' descriptions, and prioritisation on geographical area, the list was reduced for further investigation. This ultimately led to the arrest of Daniel Alderson in August 2004 and a DNA sample being taken from him. His DNA profile matched that from the crime stains.

Alderson initially denied both the offences, but later pleaded guilty and was sentenced to 6 years' imprisonment at Portsmouth Crown Court in November 2004.

Operation Phoenix

Northumbria Police re-investigated a crime which occurred in June 1980. A 19-year-old woman was on her way home after shopping when two men attacked her. One of the men raped her while his associate kept a lookout. The woman contacted the police within two hours of the attack, a number of samples were taken from her and her clothing was forensically examined, but at the time a DNA profile could not be obtained.

Using the latest advances in DNA technology the samples were re-analysed and a DNA profile was obtained. This was loaded to The National DNA Database and matched a profile from forty-five year old Paul Logan. Logan was charged following a re-investigation by the Operation Phoenix team. He pleaded guilty to raping the woman in 1980 and was sentenced to an eight-year custodial sentence. Logan was disqualified from working with children and will also be on the Sex Offenders Register for life.

STRATEGIC OBJECTIVE 4: - continued

Best practice - police

The National DNA Operations Group

The National DNA Operations Group was established in November 2003 following re-structuring of The National DNA Database Board. It is chaired by Assistant Chief Constable Stuart Hyde, of West Midlands Police, and provides a hugely important national link between the Home Office, ACPO, Scientific Support Managers and the organisations supplying DNA profiles to the Database. The Group meets every three months and provides a good forum for open debate about operational DNA issues. This year the Group has achieved success with:

- production of a revised DNA Good Practice Guide
- providing oversight for the introduction of the PACE sampling kits, which will lead to greater efficiency obtaining samples for use in evidence
- expansion of The National DNA Database by incorporation of profiles from Northern Ireland
- providing of support and advice to forces to ensure compliance with the new legislation allowing sampling on arrest
- developing agreements between forces and profiling laboratories in relation to the use of DNA for mass disaster victim identification and supporting the purchase of dedicated software, M-FISys, for this work
- making electronic match reporting from The National DNA Database available to all forces, in order to speed up and provide greater efficiency in exchange of the data

Home Office Police Standards Unit

The Home Office Police Standards Unit (PSU) works with partners in the police service to help exploit fully the opportunities provided by The National DNA Database to detect very serious crimes, where DNA matches are often a vital lead, and volume crimes.

Improvements in force business processes

In order to maximise the Home Office's investment in DNA profiling, secure resources for the future and bring offenders more quickly to justice, PSU has been working with forces to help them remodel their business processes to allow them to take better advantage of the now much faster speed of DNA analysis and production of DNA matches from The National DNA Database.

As part of this, last year PSU launched its Scientific Work Improvement Model (SWIM), a computer simulation tool which highlights pinch-points in the internal forensic processes and enables forces to optimise their resources to maximum effect. Where successfully implemented, this modelling has been shown to be effective in making more effective use of DNA in criminal investigations. PSU have offered to support forces by providing matched funding for a national rollout of this model throughout 2005/2006.

Having worked extensively in this area for several years, PSU have a clear understanding of what level of detections can be accomplished from DNA matches. This understanding is used to benchmark the performance of individual forces. PSU has plans to make forensic performance a component of its 'iQuanta' data website, which provides a wide range of analyses in the form of graphical charts and tables on current police performance, for the England and Wales forces. PSU will continue to work closely with colleagues working on The National DNA Database, ACPO, Her Majesty's Inspectorate of Constabulary and individual forces, to ensure that good practice is promoted.

Good practice in taking DNA samples

In April 2003, PSU initiated a programme of support in response to anxiety that some suspects may be passing through custody suites without a DNA sample being taken and/or a DNA profile being loaded to The National DNA Database. The main causes of many of the underlying problems and examples of good practice were obtained through a review/dip study of several forces. Since then, PSU have supported a number of forces with targeted and practical assistance.

During the 12 month project, this resulted in a reduction across the police service in administrative errors preventing samples being processed further from 2.9% to 1.7%.

Operation Advance

Andrew Kirby, admitted to rape and two counts of false imprisonment at Maidstone Crown Court and was jailed for 13 years in relation to offences that took place 17 years ago, in February 1989, when Kirby approached the victim, then an 18-year old girl, and her partner in their car, pointed a shotgun at them, and tied them up before committing the rape.

Operation Advance

Home Office Minister of State Hazel Blears said:
"This initiative is an excellent example of how collaboration between the scientific and police communities has resulted in an impressive 8 convictions.

"Almost all of the offenders convicted so far have proved to be persistent and prolific violent criminals with offending histories that stretch from the present day, back over many years. Their removal from our communities has undoubtedly had a significant impact on community safety.

"The message is clear - people who commit these horrific crimes need to know that these cases are never closed by the police and that they will be brought to justice by this and other new technologies.

"We are determined to ensure that victims receive the justice they deserve - the effect of this cannot be underestimated."

Tony Lake, ACPO lead on forensics and Chief Constable of Lincolnshire police, said:

"The outstanding results of Operation Advance owe much to the collaborative work of the Home Office Police Standards Unit, the Forensic Science Service and The National DNA Database. In a remarkably short time frame they have delivered the intelligence leads enabling forces to remove some of the most dangerous individuals from our communities.

"Bringing these individuals to justice will help protect our communities and bring closure and relief to people who have had to live with the terrible effects of these crimes over many years."

STRATEGIC OBJECTIVE 4: - continued

Good practice in Cold Case Reviews: Operation Advance:

PSU held a good practice symposium on Operation Advance cold case reviews in July 2004. A further one will be held in July 2005 to take feedback from the police on progress and launch the second phase of the Operation with a good practice guide on conducting these types of investigation. The value of familial searching in cases that have provided a DNA profile but not yet identified a suspect on The National DNA Database will also be highlighted.

DNA Liaison Panels

Monthly DNA Liaison Panel meetings and the issue of monthly bulletins have continued this year with the assistance of funding from the Home Office DNA Expansion Programme. The meetings have been well attended by force DNA Liaison Officers and/or Central Submissions Officers along with local military DNA/forensic personnel and Her Majesty's Revenue and Customs.

The introduction of the new kits for taking DNA samples under PACE and from volunteers from April 2005 will be a major change for forces. The DNA Liaison Panel forum will be used to promulgate information about the changes to the kits and to discuss procedural changes impacting on forces and forensic science organisations.

The meetings were also used to update forces on progress with reconciliation between The National DNA Database and PNC, and to provide guidance on related issues being experienced by forces. A key issue in this respect has been to reduce the number of avoidable replicate samples being taken from suspects through proper use of PNC to identify when profiles are already on the Database.

The meetings have facilitated the dissemination of information and advice from the DNA and Fingerprint Retention Project on the introduction of the Criminal Justice Act 2003 and the development of weeding rules for PNC and The National DNA Database.

DNA awareness training

DNA awareness training for forces has been delivered to some 13,000 police officers and scientific support personnel since November 2001 under the Home Office DNA Expansion Programme.

Major updates on the new legislation and use of the new sampling kits have been provided during 2004/2005 for over 1,000 force personnel, through DNA kit seminars in February and March 2005, and by means of PowerPoint presentations and an interactive CD-ROM.

Best practice - suppliers

The National DNA Database Suppliers Group

The Suppliers Group meets twice a year under the chairmanship of the Custodian to promote communication on scientific and procedural matters related to The National DNA Database, and to provide advice to the Board via the Custodian on scientific standards and scientific developments of a strategic nature.

Important topics discussed this year have included the need for improved quality assurance in the analysis of crime scene samples by introducing some duplication of analysis; data security and the move to the use of the secure Criminal Justice Extranet (CJX) for e-mail by all suppliers; the implications of the Criminal Justice Act 2003; implementation of the Freedom of Information Act 2004; introduction of the new Genemapper™ software by Applied Biosystems; the change to the new accreditation framework; and inadvertent contamination.

The National DNA Database Board has also requested that the Supplier Group revisits the use of ambient temperature storage (ATS) media for the collection and retention of DNA samples in its next round of meetings. When previously considered, whilst use of ATS media would clearly provide cost savings over storage at below -15°C, it was considered too expensive when wider considerations of the production of new kits and training the police in their use were taken into account. There had also been reservations about there being only a single commercial supplier of the ATS paper used and extent to which long term storage of samples on this paper had been validated.

A number of sub-meetings of the Group were also held. In December 2004, a meeting chaired by DCC Alan Goodwin discussed the DNA strategy within the Mass Disaster Victim Identification (MDVI) portfolio and the role and need for co-operation of suppliers in such an event. A further workshop on this topic was due to be held later in the year but had to be delayed because of the Tsunami disaster. In February 2005, the suppliers met with staff from the CPS to discuss the developing guidance for charging on the basis of a Database match (see page 30) and the development and provision of the new PACE and Volunteer sampling kits.

In March LGC Ltd. hosted a highly successful Technical Group meeting to discuss aspects of sequencing instrumentation, updated analysis software and business continuity issues with Applied Biosystems. Further technical meetings will be held as required to deal with other technical changes.

Operation Advance

On November 4, 1995 a 23-year-old woman was walking home from a Nottingham pub where she had been celebrating her friend's hen night. Around midnight she saw a man, and as he approached her he suddenly grabbed her and dragged her screaming into a nearby yard where he beat and raped her. The woman managed to stagger to a police station and raise the alarm.

Nottinghamshire Police's major crime unit carried out an investigation but despite several arrests, no one was charged. A swab was taken from the victim, but it contained insufficient DNA for a profile to be obtained at that time.

In 2001 Mark Henson was convicted of the attempted rape of a 53-year-old woman and jailed for life. His DNA profile was loaded to The National DNA Database.

In 2004, the unsolved rape case from 1995 was selected for review as part of Operation Advance. Slides from the swab had been retained and were sent for Low Copy Number DNA profiling. This produced a DNA profile that was loaded to The National DNA Database and matched the profile of Henson. Henson was interviewed in prison and when told about the DNA sample he admitted the offence.

STRATEGIC OBJECTIVE 5: To develop use of The National DNA Database in partnership with other agencies in the Criminal Justice System

Charging on the Basis of a National DNA Database Match Report

In order to ensure realisation of the full benefits of the implementation of the new legislation allowing DNA samples to be taken from arrestees, and to facilitate the bringing of earlier prosecutions by the CPS, the Home Office issued an amendment to section (23) of Home Office Circular 16/95. This had previously stated that "The DNA database is an intelligence database only. It is not intended that the results of any analysis carried out solely for the database or that the fact that a match was found during a speculative search will be used for prosecuting purposes." The amended version, issued as Home Office Circular 58/2004 on 3 September 2004, said that "Speculative searches may be carried out of The National DNA Database and a suspect may now be charged on the basis of a match between a profile from DNA from the scene of the crime and a profile on The National DNA Database from an individual, so long as there is further supporting evidence. The amount of supporting evidence required will depend on the value of the DNA evidence in the context of the case. A scientist should be consulted where the value of the DNA evidence requires clarification."

It is important to note here that the suspect will not be charged on the basis of DNA evidence alone.

If there is an indication of a guilty plea, and there is sufficient other supporting evidence, the prosecution will proceed on the basis of the match report from The National DNA Database; a separate statement will not usually be required from a scientist. If there is no indication of a guilty plea, but the DNA evidence is not in contention, the prosecution will also proceed on the basis of the match report without any further statement from a scientist. However, if there is no indication of a guilty plea and the DNA evidence is likely to be contested, the scientist will initially provide a short statement simply reporting that the profiles attributed to the subject sample and crime scene sample match. In all of the foregoing circumstances no additional analysis of the samples will be carried out. If

there is a not guilty plea and the DNA evidence of identification is an issue, or the DNA evidence needs to be placed in the context of other scientific evidence (e.g. blood distribution), the scientist will carry out further analysis and produce a full evaluative statement. This further analysis will be carried out on a new sample obtained under PACE from the suspect, or from the sample on which the match report from The National DNA Database was based if this was taken and processed to evidential standards.

Identification of Deceased Persons

Serious Organised Crime and Police Act 2005

The Serious Organised Crime and Police Act 2005 received Royal Assent on 7 April 2005. Section 117(7) of the Act amended section 64 of PACE. Previously, samples taken under PACE could be used only for purposes related to the prevention and detection of crime, the investigation of an offence or the conduct of a prosecution. These restrictions remain, but the samples and the data derived from them, can now also be used for the "identification of a deceased person or of the person from whom a body part came".

Deaths by natural causes

The new legislation now allows The National DNA Database to be used to assist coroners with the identification of victims of death by natural causes. This includes individual unidentified deceased persons or recovered body parts, for example in cases of suicide and accidents, and the identification of victims of mass disasters, such as those who died as a result of the South East Asian tsunami.

Prior permission to take samples for DNA profiling for identification purposes should in all cases be sought from the Coroner. Any tissue retained for this purpose may also have to be immediately returned to the body after profiling.

STRATEGIC OBJECTIVE 6: To enhance the position of The National DNA Database as the world-leading DNA Database

International sharing of DNA data

Central to the Government's Forensic Integration Strategy is the intention to ensure that DNA information held by one Member State is readily available to investigators in another Member State. The critical issue in achieving this is ensuring that national procedures are inter-operable to the maximum possible extent. This is being achieved via the development of common business processes and safeguards which are being taken forward by complementary work undertaken in the EU and G8.

Interpol DNA Database

Interpol has developed a DNA database to which member countries are able to submit profiles of known offenders or unidentified profiles from crime scenes. This Database has been in use since 2003 and is currently being upgraded with new matching routines and nationally specified filters. Testing of the new system by 12 countries is currently underway. The technology available at Interpol is able to detect and report possible matches to National Central Bureaux via the secure gateway (known as I24/7). Further information/work is then progressed on a bilateral basis.

Custodian financial statement

Provision of Custodian services (Database operational services to the police) has been funded in previous years through charges made to police forces per profile loaded to The National DNA Database. The mechanism for charging the England and Wales forces changed at the start of 2004/2005, such that the Home Office provided the funding directly, but based upon a budget bid provided by the Custodian and approved by The National DNA Database Board. Charges to other forces, most notably those in Scotland, have continued to be levied on the basis of profiles loaded. In addition, charges have continued to be made to all forces for specialist work such as one-off searches of the Database.

The costs of Supplier accreditation activity have continued to be charged to the supplier laboratories.

Income and expenditure for 2004/2005 in relation to these two areas are set out below, alongside the equivalent figures for the previous year.

The increase in costs in 2004/2005 compared with the previous year reflects a greater recognition of the direct and indirect subsidies provided by the FSS, and the mis-match between income and expenditure in relation to accreditation highlights this markedly. The 2004/2005 income for Custodian services was greater than that budget for due to an unexpected increase in demand for one-off specialist searches. This consequent excess of income over expenditure has offset the FSS subsidy to the accreditation area.

The charges to suppliers, which hitherto have been made on a test by test basis, will be replaced from the start of 2005/2006 by an annual subscription charge, payable in monthly installments, to cover all of the routine accreditation and performance monitoring services provided. Charges in relation to new process accreditations will be calculated on a case by case basis, based upon a transparent record of the actual time taken by accreditation specialists.

The cost of DNA Database IT development has, as in previous years, been provided for by the Home Office through DNA Expansion Programme funding. The cost in 2004/2005 was ca. £1.25 million, roughly the same as in the previous year. Funding for IT development in future is expected to continue in the same vein.

A key step forward this year in relation to IT development has been the building of a dedicated team of in-house (FSS) IT specialists to carry out this work. This is proving to be much more cost effective than the previous arrangements which relied heavily on external contract staff.

	2003/04	2004/05
Custodian Services Income	£ 1,046,047	£ 1,556,153
Custodian Services Costs	£ 904,385	£ 1,276,823
Supplier Accreditation Income	£ 202,954	£ 230,106
Supplier Accreditation Costs	£ 388,047	£ 433,828

Response to recommendations from independent reviews of the operation of The National DNA Database

Independent reviews

House of Lords' Select Committee on Science and Technology: March 2001

The House of Lords' Select Committee, in its report "Human Genetic Databases: challenges and opportunities", recommended that the Government should establish an independent body, including lay members, to oversee the workings of The National DNA Database, to put beyond doubt that individuals' data are being properly used and protected.

Human Genetics Commission: May 2002

The Human Genetics Commission, in its report "Inside Information: balancing interests in the use of personal genetic data", acknowledged the high level of public acceptance of the need to collect and store DNA material that would enable offenders to be identified. But it emphasised the importance of retaining public trust and raised a number of ethical issues about the storage of samples. It also identified a number of concerns about future research and made proposals for an independent body with lay membership to oversee The National DNA Database, with a separate national ethical committee to approve all research projects involving the use of DNA samples.

McFarland Review of the Forensic Science Service: July 2003

In the context of the recommendations of the reports from the House of Lords' Select Committee on Science and Technology and the Human Genetics Commission, and in light of the proposed privatisation of the FSS, McFarland recommended that the Custodianship of The National DNA Database should be removed from the FSS. He also proposed that accountability for the storage and access to CJ samples, currently held on behalf of police forces by suppliers, should pass to the Custodian, and he supported the concept put forward by the Human Genetics Commission for a national ethics committee.

Williams, Johnson and Martin: August 2004

In a research study funded by the Wellcome Trust, Williams, Johnson and Martin, in their report "Genetic Information and Crime Investigation: Social, Ethical and Public Policy Aspects of the Establishment, Expansion and Police Use of The National DNA Database", made a number of wide-ranging recommendations. These included recommendations for:

- an authoritative review of the robustness of the current methods used for STR profiling, the adequacy of the current numbers of STR markers in light of the expanding size of the database, and the nature of the 'duplicate samples' on the database
- consideration of the scientific case for fully independent re-testing of 'evidential samples' along with the potential effects on public confidence of a move to abandoning the routine second sample testing where evidence is not required to support criminal prosecutions
- wider political and public debate in relation to future policy discussions of the further expansion and developing uses of The National DNA Database
- more priority and resources to be given for an independent evaluation of the effectiveness of police uses of The National DNA Database for detecting crime and widespread public dissemination of such an evaluation
- the creation of an independent oversight body with lay members to monitor the management, use and future development of The National DNA Database (in consultation with key stakeholders and other public bodies such as the Human Genetics Commission and the Information

Commissioner) and to promote openness and transparency in accordance with the principles underpinning the Freedom of Information Act

- the establishment of arrangements for the independent scrutiny of research projects based on forensic genetic data held by the Custodian or derived from CJ and crime scene samples held in profiling laboratories
- the retention of DNA samples for a limited period only (in the case of matched crime scene samples this should be until the end of any sentence served by individuals whose prosecution involved the use of DNA evidence).
- reference to be made to the Information Commissioner as to whether the DNA profiles themselves should be treated as potentially sensitive personal information
- urgent legal and political consideration to be given to the on-going practice of including on the Database those arrested but not charged with a recordable offence.
- improved protection to be provided for voluntary donors to ensure that consent is fully informed, freely given and subject to revocation on the part of the donor
- further consent to be sought when samples and profiles are to be used for research purposes
- current ACPO guidelines for the investigative use of familial and partial matches to be kept under continuous review so that new developments in this technology are properly understood and deployed by investigating officers
- all applications of forensic DNA profiling and The National DNA Database to be fully informed by knowledge of public attitudes and a precautionary principle to be exercised in order that public confidence in the use of the NDNAD is maintained
- the current exploration of the scientific and legislative underpinnings of data-sharing, especially those that involve the inter-operability of database searching across national jurisdictions, to be supplemented by a more thorough consideration of the social and ethical issues that are raised by these developments
- proposals for the further extension of The National DNA Database to become a universal database not to be pursued by the Government

Genewatch UK: January 2005

In their report 'The Police National DNA Database: Balancing Crime Detection, Human Rights and Privacy, Genewatch UK recommended that:

- DNA samples (except samples from the scene of a crime) should not be retained once an investigation is complete. Only DNA profiles and personal data need to be on the database to find a 'match' for a criminal investigation
- research uses of the database itself (profiles and personal data) should be restricted to producing 'quality control' statistics on the type of data that has been added and how the data is being used
- an independent body should be set up to review all future applications to access the data and samples for forensic and non-forensic purposes; to ensure standards are maintained; and to ensure public accountability and transparency
- an 'Innocence Project' should be established to investigate possible miscarriages of justice using DNA
- an independent review of whose DNA data should be sampled and retained is urgently needed, and research on the use of the NDNAD, its effectiveness and the justification for including innocent people, should be conducted to inform the debate
- the personal data and DNA profiles from people against whom whose charges have been dropped, or who have been acquitted, should be removed from The National DNA Database (unless they were connected with a serious violent or sexual offence)

- DNA samples should not be taken until a person has been charged, unless needed to help prove or disprove a suspect's involvement in a specific offence
- the database should not be expanded to include the whole population
- people's personal data and DNA profiles should not be kept indefinitely on the database (except when they have committed serious violent or sexual crimes)

House of Commons Select Committee: March 2005

The Science and Technology Committee of the House of Commons, in their Report 'Forensic Science on Trial', expressed concern that the Home Office had failed to establish an independent body to oversee the work of The National DNA Database or to give proper ethical consideration to decisions about the use of the data in the Database.

The Report also included more detailed comments from a range of individuals about the oversight and management of The National DNA Database. These included concerns about:

- the adequacy of the current 10 marker profiling system to provide a sufficient level of discrimination to prevent an individual being wrongly identified with an offence on the basis of a chance match
- the legislation that allows permanent retention on The National DNA Database of DNA profiles from persons who have not been prosecuted or have been acquitted, which was introduced without proper justification or meaningful public debate and is highly discriminatory
- the unnecessary retention of samples following their successful profiling and the lack of strict controls to prevent subsequent misuse of these samples
- the inability of persons who have provided samples voluntarily for elimination purposes and consented to their DNA profiles to be added to the Database to withdraw that consent at a later stage
- the need for separation of The National DNA Database Custodian from the FSS and an independent body, with lay membership, to have oversight over the work of the Custodian and the DNA profiling laboratories
- the need for a national ethical committee to approve all research projects involving the use of DNA samples and data from The National DNA Database, and for individuals to provide specific consent for their samples and data to be so used
- the specific advent of familial searching of The National DNA Database to identify potential relatives of offenders who themselves do not have profiles on the Database, ethnic inference services and the determination of physical characteristics from DNA samples, in the absence of any Parliamentary debate about the merits of these approaches and their ethical implications
- failure to keep live cases where DNA evidence has been used to convict someone who continues to protest their innocence, so that if another profile is added to The National DNA Database that matches that used in the conviction of the individual it will be spotted and acted upon

National DNA Database Board responses

Issues related to the provision of independent oversight of the working of The National DNA Database and separation of the Custodian role from the FSS have been dealt with fully earlier (see page 5). Familial searching has also been commented on fully (see page 26). These responses relate to the other major issues of concern that have either not been addressed elsewhere or only partially so.

Establishment of a Research Ethics Committee

All requests for access to samples or data from The National DNA Database for research purposes have been considered by The National DNA Database Board, taking due account of the legality of the purpose (which must be for the prevention and detection of crime or the investigation of an offence), the requirements of the Criminal Justice System and public interest. The Board has taken account any advice provided by the lay member nominated by the Human Genetics Commission and where necessary the Information Commissioner. Due consideration has also been given when deciding what specific information should be released to compliance with the requirements of the Data Protection Act 1998.

Ten requests have been approved to date. One of these was for the provision of a copy of the Database with all personal identifiers removed to assist with the development of the True Allele expert system used by some profiling laboratories for designating the markers in profiles to be added to the Database. Another was related to a police operational request for Database information to help evaluate the Pathfinder project (aimed at developing best practice in the collection and analysis of DNA samples in burglary/vehicle crime cases) and a third was to help identify persons on a force's dangerous offenders' register who did not have profiles on The National DNA Database. The remaining six requests came from providers of forensic science services who wished to conduct research in areas that may assist in future investigations. These involved the provision of anonymised samples for Y chromosome analysis, to generate a Y-chromosome frequency database that would help in assessing the significance of an individual having a specific Y-STR DNA profile; the provision of anonymised data on ethnic appearance (as perceived by the police, not ethnic origin) for the development of an ethnic inference database for predicting the likelihood of an undetected offender having one ethnic appearance as opposed to another; the provision of anonymised data for development of the familial searching approach for identifying potential relatives of an offender who are on the Database when the offender's profile is not on the Database; the provision of anonymised data for familial search applications in specific cases; the provision of data to assist with research into obtaining DNA profiles from fingerprints; and the provision of anonymised data for assessment of the use of rare markers in geomapping/crime pattern analysis of offences.

For the future, in recognition of the concerns that have been expressed over these arrangements, approaches have been made to the Central Office for Research Ethics Committees (COREC) with a view to their providing a further level of independent ethical oversight in this area.

Retention and management of use of DNA samples and DNA profiles on The National DNA Database

The legal position

Section 64 of PACE set out the circumstances under which samples should be destroyed. These were essentially, with certain exemptions, as soon as practicable after a person is cleared of the offence; the case against him is discontinued and he has not admitted it and been dealt with by way of a caution; and he is no longer suspected of having committed the offence.

Home Office Circular 16/95 also required that when samples are retained, this should only be for the same period as the person's criminal record on Phoenix and that the samples should be destroyed when the associated Database record is weeded.

Section 82 (2) of the CIPA removed the requirement to destroy samples in accordance with Section 64 of PACE 1984, but added that the retained samples could only be used for purposes related to the prevention and detection of crime, the investigation of any offence or the conduct of any prosecution. This development has been challenged on the grounds of infringement of Human Rights. The House of Lords ruled against the appellants, but steps are being taken to appeal further to the European Court of Human Rights in Strasbourg.

Meanwhile, the samples, and information derived from the samples, are still being retained, and since commencement of the CIPA, little weeding of subject sample profiles from The National DNA Database or destruction of samples has been undertaken.

There is no legal requirement relating to the destruction of volunteer samples for which consent has been given for loading to The National DNA Database.

Reasons for retention of samples

The main reason for retaining samples after a profile has been obtained is for re-analysis, should it be decided to adopt new technologies for DNA profiling. The need for this was recognised from the outset, in Home Office Circular 16/95. Subject samples have consequently always consisted of two buccal scrapes or about 10 pulled hairs with roots, and only part of one scrape or the hair sample is normally used for analysis to generate the DNA profile, leaving material over for storage and upgrading as required.

A change in technology has already happened once, in 1999. When The National DNA Database was established in 1995, the DNA analysis was based on a technique known as SGM profiling which tested for 12 STR markers and a gender indicator. As the size of the Database grew, however, the level of discrimination available with this system (a match probability of about 1 in 50 million between full profiles from unrelated individuals) gave rise to an increased risk of DNA profiles matching just by chance. So, a new profiling technique was introduced, known as SGM Plus® profiling, which tested for 20 STR markers and the gender indicator, and had a match probability of 1 in 1,000 million. To date, no chance matches between full SGM Plus® profiles from unrelated individuals have been observed using this new approach.

Additional STRs may, however, be needed as the size of the Database grows. This would be to increase the discriminating power further, to help avoid chance matches between profiles from close relatives, and to provide more points for comparison when partial profiles are obtained (e.g. where crime scene samples are degraded). More STR markers would also be useful for international cross-searching of DNA databases in respect of cross-border crime, by making more data available for comparison with DNA profiles obtained in other countries. Many of these countries, like the United Kingdom, use SGM Plus®, but others use different profiling techniques (e.g. Cofiler, Profiler, Identifier) that test for up to 16 STRs, and some of these are clearly not tested for with SGM Plus®. Storage of the subject samples allows them to be retrieved, re-analysed and upgraded in respect of these other markers in their DNA profiles as the need arises.

There are other reasons for retaining the subject samples after their analysis. For example, they are regularly accessed by the profiling laboratories to provide samples for duplicate analysis as part of their quality control programmes, for re-analysis for match verification purposes and for trouble shooting when concern is identified about the reliability of a profile or its association with the right individual. They may

also need to be retrieved to assist with investigations into potential miscarriages of justice.

In certain circumstances, with the prior approval of The National DNA Database Board, the retained samples may also be used for the purpose of research aimed at the prevention or detection of crime. An example of this is to develop Y-STR frequency databases (from anonymised data from The National DNA Database) that would be used to establish the discriminating power of Y-STR profiles. Y-STR profiles can provide information about the male contributor in mixed male/female samples (e.g. in rape cases) that may otherwise not be obtainable.

The retained samples may also be accessed and analysed further following a familial search of The National DNA Database. Such searches identify a list of potential relatives of an offender who is not himself/herself on the Database. Analysis of their samples using Y-STR or mitochondrial DNA techniques can significantly eliminate many of these potential relatives from further consideration, thereby avoiding unnecessary intrusion by the police into their private lives.

Oversight and control and of stored samples

Samples are currently taken from individuals by the police (or a Force Medical Examiner/pathologist) and submitted to an approved laboratory for profiling. After analysis, the laboratories are required by the Custodian to retain the samples in a secure storage and retrieval system at a temperature below –15°C. Auditing of the storage and retrieval arrangements is currently carried out on behalf of the Custodian by the United Kingdom Accreditation Service, under the LAB 32 agreement between the Custodian and UKAS, during their ISO 17025 inspections of the laboratories' operations. There are plans for the Custodian to have more direct involvement in the auditing in future.

Volunteer samples for which no consent has been given for loading to The National DNA Database should be destroyed once they have served the purpose for which they were provided.

Value of retaining in The National DNA Database profiles from persons who have not been prosecuted or have been acquitted

There is a need to balance the interests of society against the right to privacy of the individual and the Government believes that that balance should be tipped in favour of the victims of crime and the protection of individuals against crime. In this respect, the Government firmly believes that the measures taken to retain the samples and fingerprints of persons who have been arrested, albeit not prosecuted or convicted, for a recordable offence are proportionate and justified. That view has been thoroughly tested and supported by the Law Lords in the case of *R v Chief Constable of South Yorkshire ex parte S and Marper*.

Although it was acknowledged that some persons who have not been convicted of an offence sometimes felt aggrieved that this biometric information is retained, the Law Lords in the quoted case rejected the suggestion that this group of people are somehow stigmatised as a result. Persons who do not go on to commit an offence have no reason to fear the retention of this information.

It is estimated that there are roughly 186,900 records from different individuals on the Database that would have been removed under the legislation prior to the CIPA. To date, the Database has been able to link some 7,591 (5%) of these individuals to approximately 10,754 offences. These include 88 murders, 45 attempted murders, 116 rapes, 62 other sexual offences, 91 aggravated burglaries, 94 the supply of controlled drugs and a number of serious assaults. It is not known how many of these might otherwise have gone undetected.

Consent for DNA samples to be used for research purpose

The legislation specifies that any sample taken under PACE can be used for purposes related to the prevention and detection of crime. No consent is required for the taking of most samples and no separate consent is required for the samples and any data derived from the samples to be used for these legitimate purposes. Samples taken from volunteers can also be used for the same specified purposes. So long as the requirements of this legislation and data protection considerations are complied with, and due account is taken of any independent ethical advice that has been provided, there will be no misuse of the samples or data, and no risk of the individual suffering adverse consequences. The Board thus sees no need to request consent for the DNA samples to be used for research purposes.

Ethnic inference

The National DNA Database records the 'ethnic appearance' of a person from whom a sample is taken for DNA analysis. This is in one of the 7 standard fields within a National DNA Database record listed on page 7. It may or may not relate to their ethnic origin. It is used primarily to help reduce a target population on The National DNA Database whose profiles match that from a crime scene sample where the offender is reported to have a specified ethnic appearance.

It is also possible to provide an inference of an offender's origin from DNA analysis of material from the crime scene. This is because the markers in the DNA profile have different frequencies of occurrence in different ethnic groups. However, it is only an inference and does not provide substantive evidence of ethnic origin. It is used, infrequently, and only where appropriate, to help prioritise the direction of a police investigation. It is not used as evidence if the suspected offender is found. Here, the matching DNA profile would be obtained.

Ability of volunteers to withdraw consent for their profiles to be added to The National DNA Database

The rationale for not permitting a volunteer to withdraw their consent to their profile being retained on The National DNA Database is to avoid a return to the situation prior to the CIPA, where consent had been given and then withdrawn, but for whatever reason the profile remained on the Database and it was found to match that taken from a crime scene, leading to arguments as to the admissibility of such evidence in subsequent criminal proceedings. Withdrawal of consent could also be a precursor to future illegal activity. The information held on the Database is only used if a stored sample is matched with a sample recovered from a crime scene. As with individuals acquitted of an offence for which DNA was taken and those whose prosecutions are not proceeded with, a law abiding person has nothing to fear from having their profile on the Database.

The adequacy of the 20-marker SGM Plus® DNA profiling system

The probability of a match between the SGM Plus® profiles of two unrelated individuals, as discussed on [see page 9], would be of the order 1 in a trillion if the values of the markers were all independent, but much larger for related individuals – of the order 1 in 10,000 for full siblings.

The likelihood of a chance match between full SGM Plus® profiles from unrelated individuals is very small and, as yet, none has been observed. The likelihood of a chance match will increase, however, as the size of the Database grows, or comparisons are being made with other national DNA databases as well, or there are close relatives on the Database, or the subject sample profile is based on SGM analysis. It will thus never be correct to claim uniqueness between any DNA profile and an individual, and the evidential significance of a match between a suspect and a crime

sample, whatever the match probability, must always be viewed within the context of whatever other evidence there is, such as geography, opportunity, alibi, eyewitness, and so on.

The risk of a chance match is also increased where the crime scene profile is partial. Comparison of partial profiles from crime scene samples with profiles from persons on The National DNA Database is consequently more likely to result in matches being found relating to more than one individual. One of these may be the offender. They may all, or all but the one matching the offender's profile, be chance matches. The more partial the profile from the crime scene sample, the greater the possibility of chance matches being obtained.

Partial profiles are obtained from crime scene samples in approximately half of all cases. This is because the material recovered from crime scenes for DNA analysis can be degraded and limited in quantity, and the degradation process breaks the DNA molecules into very short fragments which are not amenable for DNA profiling using the multiplexes currently commercially available, which tend to detect only relatively undegraded DNA.

It would be possible to improve further the discriminating power of the DNA profiling system used for The National DNA Database by testing for more markers, either sequentially, using complementary commercially available multiplexes such as COfiler™ (6 additional markers) or Profiler® (10 additional markers), or using large commercially available single multiplexes such as Powerplex® 16 (30 markers) and Identifier® (30 markers). These could be used as a replacement for SGM Plus® or in addition, and would undoubtedly improve the discriminating power. But this approach would not improve performance in respect of partial profiles being obtained. In fact, the evidence suggests that the larger the multiplex in terms of the number of markers analysed, the less efficient it becomes, and this means that even more partial profiles could result.

Recent extensive collaborative research studies by the European EDNAP and ENFSI groups have demonstrated that the success rate for analysis of degraded samples can, however, be substantially improved by testing markers based mini-STRs (shorter lengths of DNA). The preferred way forward is therefore to incorporate some of these mini-STRs into new multiplexes (see ENFSI website <http://www.enfsi.org/ewg/dnawg>) and this approach was unanimously agreed by EDNAP/ENFSI at the last meeting held in Glasgow earlier this year. At the same time, work has been proposed to re-engineer the tests for the existing markers to make them easier to detect in degraded DNA. A way forward in the UK could thus be to add between 6 and 12 loci from the mini-STR to the current 20 SGM Plus® markers.

It is anticipated that it will take approximately two years for the manufacturing companies to develop a new multiplex and for it to be validated. Such a system could then be used for all DNA profiling for The National DNA Database for the foreseeable future. It would be impracticable to re-analyse and upgrade all the samples on which the current Database is based, but it could be used, whenever appropriate, to upgrade profiles obtained earlier with SGM/SGM Plus® whenever they are involved in matches.

Retention of crime scene sample profiles on The National DNA Database following a match with a subject sample profile

When a crime scene sample profile is found to match a profile on The National DNA Database from one or more individuals, the Custodian sends a match report to the police. The police then carry out an investigation. If this leads to a successful prosecution, the police are advised to notify the

Custodian to remove the crime scene sample profile from the Database, to prevent further redundant match reports being issued for the same offence if the convicted individual is subsequently arrested as a suspect for another offence and another profile for that individual is added to the Database.

This efficacy of this process depends entirely on the police notifying the Custodian when suspects are convicted. There can be significant delays in this information being passed on and in many cases the Custodian is never informed. It has therefore been proposed that, in future, the crime scene sample profile will be removed immediately if the match involves full SGM Plus® profiles, the likelihood being that in such circumstances the suspect identified is the source of the DNA from the crime scene. If, in due course, this turns out not to be the case, and the match is a chance one, the crime scene profile could be reinstated on the Database.

The removal of crime scene sample profiles from the Database has attracted some criticism on the grounds that it precludes alternative potential suspects for the crime being identified at a later stage. Where the crime scene sample profile is a full SGM Plus® one, this risk of this is low, and in any event the retention of the original matching subject sample profile would provide a match with the new subject sample profile and highlight the need for any actions resulting from the previous match to be reconsidered. If the crime scene sample profiles were partial, however, there could be subjects with different DNA profiles whom it would match, and if the crime scene profile had been removed following the initial match the subsequent additional potential suspect would not be identified. For this reason The National DNA Database Board will be considering an alternative approach that will prevent the same match being reported repeatedly whilst at the same time leaving open the possibility of further suspects being identified.

Where a suspect is identified for an offence from the outset, a reference sample may be submitted from the suspect to a laboratory for DNA analysis and direct comparison with the DNA profile from the crime scene. The suspect's profile should also be added to The National DNA Database, whether or not the profiles match. This does not always happen either because the police do not indicate whether the profile is from a sample taken under PACE and can thus be loaded to the Database or the laboratory fails to act on such information (an issue now addressed through introduction of the new PACE and Volunteer sampling kits). If no match is found between the suspect and crime scene, the crime scene profile is added to The National DNA Database in an attempt to identify anyone else who may have committed the offence. However, if a match is found between the original suspect and the crime scene, the crime scene profile is not added to The National DNA Database to check for any other individual who may also have a matching profile. It would be a matter for the CPS, in light of all the other evidence in the case, to decide whether such further action would be appropriate.

A universal DNA database

The Government appreciates that some people may be concerned about building a larger DNA database, particularly where it relates to people who have not been proceeded against for an offence, but has concluded that any intrusion on personal privacy is both necessary and proportionate to the benefits for victims of crime and society generally in terms of detecting crime and protecting the public against criminals. However, there are no Government plans to introduce a universal compulsory, or voluntary, DNA Database for the whole population of the United Kingdom. Indeed, to do so would raise significant practical and ethical issues. It would be difficult to achieve given the number of visitors as well as residents, expensive and lack public support. The targeting of subjects to be profiled based on their suspected involvement in a criminal offence is more cost-effective and acceptable.

Y-STR profiling

In Hertfordshire, in late March 2004, a young woman was walking home when an unknown assailant struck her from behind. She was dragged onto a nearby golf course where she was raped and subjected to an horrific sexual assault. Four days later, another woman was attacked in very similar circumstances when walking along a road close to her home address. She was grabbed from behind and forced off the pavement into a grassy copse area raped and sexually assaulted.

A DNA profile was obtained from a semen stain on the jumper of the victim of the March attack. This matched one on The National DNA Database from Petros Anthia, which had been retained in relation to an alleged rape committed in North London in 2001 for which he had been acquitted (victim refused to testify). It was later established he had a girlfriend residing in the area of the attacks. He was promptly arrested by Hertfordshire Constabulary and reference samples obtained to confirm the match.

Examination of a stain on the victim's black top submitted in relation to the April attack resulted in a complex mixed DNA profile being obtained. There were indications that DNA from three people was present, but it was not possible to obtain a discrete profile for searching against The National DNA Database.

The police were anxious to question the new suspect about his involvement in both crimes together with several other matters. Comparison of his DNA profile against the profile from the second crime showed he could not be eliminated, but the complex nature of the mixture meant that it was unlikely to give conclusive evidence.

It was then decided to attempt Y-STR analysis on the mixture. Y-STR analysis is a technique that looks at variable genetic regions present only on the Y-chromosome. As only males have a Y-Chromosome it can be very useful in analysing mixtures, especially in sexual assault cases where the DNA profile of the offender is mixed with components from a female victim. A full Y-STR profile matching the suspect's was obtained from the complex stain, confirming the link between the two offences.

Anthia was subsequently linked with other material and he was duly charged with ten counts of rape and other sexual assaults. He initially denied these charges, but changed his plea during the trial and was duly sentenced to ten terms of life imprisonment, with the judge's recommendation that he serve a minimum of 25 years.

Glossary

ACPO

Association of Chief Police Officers

ACPO(S)

Association of Chief Police Officers (Scotland)

Allelic Markers

Pairs of STRs at a given locus on the chromosome, one inherited from the mother and the other from the father, that make up the DNA profile.

Amelogenin

The marker incorporated into DNA analysis which indicates the gender of the individual.

APA

Association of Police Authorities

ASN

Arrest Summons Number

Bichard Inquiry

An independent inquiry arising from the Soham murders, which addressed, inter alia, the effectiveness of the relevant intelligence-based record keeping and information sharing between agencies.

CJA

Criminal Justice Act 2003

CJPA

Criminal Justice and Police Act 2001

Contamination

DNA inadvertently deposited or transferred to an item after an offence.

CPS

Crown Prosecution Service

Custodian

The person accountable to The National DNA Database Board for maintaining the integrity of the data held on the Database and the efficient and effective provision of the Database information and services specified by the Board.

DNA

Deoxyribonucleic acid, a substance found in most cells of all people, and in the cells of animals, plants and other organic matter. Variations in the DNA code are responsible for physical differences between individuals including their sex, height, hair and eye colour. Except for identical siblings, each person's DNA is unique.

DNA profile

The pattern of DNA characteristics obtained from the non-coding regions of DNA that forms the basis for comparing biological material from scenes of crime with individuals. A DNA profile may be visualised as a pattern of bands on a computer screen, as a graphic representation known as an electropherogram (EPG) or as a numeric code such as that stored on The National DNA Database.

DNA profiling

The laboratory technique used to obtain a DNA profile.

DNA sample

A sample from an individual, such as a mouth swab, plucked hair roots or blood, or a sample from a crime scene, obtained for the purpose of DNA profiling.

Mouth swab

A sample of cellular material that has been collected from an individual by rubbing a swab on the inside of the cheek. A mouth swab may also be referred to as a Criminal Justice [CJ] Sample, a PACE or Evidential Sample, an Elimination Sample or a Volunteer Sample. Collectively these are referred to as Subject Samples.

Criminal Justice [CJ] Sample

A non-intimate DNA sample (cheek scrape or hair root) taken under PACE from a suspect arrested, charged, reported or convicted for a recordable offence, primarily for intelligence purposes only. In exceptional circumstances, if a separate evidential sample cannot be obtained and it is in the interests of justice, the Chair of The National DNA Database Board may authorise its use for evidential purposes. CJ sample profiles are added to The National DNA Database.

PACE or Evidential Sample

An intimate or non-intimate DNA sample taken from a suspect under PACE in relation to a recordable offence for use in evidence. Evidential sample profiles may be added to The National DNA Database.

Elimination Sample or Volunteer Sample

A DNA sample provided with consent by an individual for elimination purposes. The sample and information derived from it are usually destroyed once they have served the purpose for which they were taken, and the DNA profile is not added to The National DNA Database unless additional written consent for this is provided by the

individual. Once given, this consent cannot later be withdrawn.

Crime scene sample

A biological sample (e.g. blood, hair, semen, saliva) recovered from a scene of crime which is analysed to obtain information about the offender. Crime scene sample profiles relating to offences for which there is no immediate suspect are added to The National DNA Database.

EDNAP

European DNA Profiling Group, a working group of the International Society for Forensic Genetics, comprised of members from 16 countries whose main objective is the harmonisation of DNA profiling technology for crime investigations.

ENFSI

European Network of Forensic Science Institutes

Ethnic Appearance

The ethnic origin of an individual as perceived by the person taking a DNA sample. Ethnic appearance on The National DNA Database is recorded in one of 7 categories: Afro-Caribbean, Arab, Asian, Dark Skinned European, Oriental, White Skinned European and Other.

Familial Search

A search of The National DNA Database for potential close relatives of an offender whose profile is not on The National DNA Database.

FSNI

Forensic Science Laboratory of Northern Ireland

FSS®

The Forensic Science Service®

Genetic information

Information derived from the coding part of DNA which controls all chemical processes in the body and determines our physical characteristics. The DNA profiles obtained for The National DNA Database are not derived from the coding region of the DNA molecule and do not contain such genetic information.

HGC

Human Genetics Commission, an advisory body set up by the UK Government at the end of 1999 to consider the public interest issues in relation to developments in genetic science.

Glossary - continued

Home Office Circular

Home Office Circulars are used to provide up to date information on legislation and policy changes to stakeholders throughout the Criminal Justice system.

IDENT 1

A platform for the next generation of identification services for the police service, introduced by PITO during 2005, which hosts the national collection of 6 million fingerprint records.

ISO17025

The international quality standard for testing laboratories.

Livescan

A system for capturing electronic copies of fingerprints using a scanning device without the use of ink. The images are converted into digital format and then transmitted to a Fingerprint Bureau.

National DNA Database

An electronic collection of DNA profiles attributed to individuals or scenes of crime. The individuals are those suspected, charged, reported for or convicted of a recordable offence or consenting volunteers.

NSPIS Custody

National Strategy for Police Information System, a product designed to enable granular access control, maintain data integrity and facilitate data sharing in a secure manner by police forces.

PACE

Police and Criminal Evidence Act 1984

Pendulum List Search

A technique for identifying individual DNA profiles that are contained within a two-component mixed DNA profile and prioritising these for searching against The National DNA Database.

Police Elimination Database (PED)

A database, distinct and separate from The National DNA Database, containing DNA profiles of police officers, crime scene examiners and police ancillary personnel. It is used when requested by the senior investigating officer to help identify instances where DNA has been inadvertently left at the scene of crime during the investigation of the offence and the recovery and dispatch of crime scene samples to the laboratory for analysis. Since 1 April 2003, police regulations have required all new police recruits to the service to provide a sample for the PED.

Police National Computer (PNC)

PNC holds extensive data on criminals, vehicles and property and is accessible from over 120,000 terminals across the country. In particular, it contains details of persons from whom DNA samples have been taken under PACE. A subset of these details is transferred electronically to create a stub record on The National DNA Database to which the DNA profile is subsequently attached.

PSU

Home Office Police Standards Unit. PSU was set up by the Home Secretary in July 2001 and forms a vital part of the Government's police reform agenda. PSU measures and compares the performance of Basic Command Units (BCUs) and local partnerships, identifies the underlying causes of performance variations, and identifies and disseminates good practice and support to those who need assistance.

PITO

Police Information Technology Organisation, a non-departmental public body providing procurement advice and IT and communication systems to the police service and criminal justice organisations in the UK.

Recordable Offence

A recordable offence is broadly an offence that could lead to a custodial sentence. Recordable offences are set out in The National Police Records (Recordable Offences) Regulations 2000 and include a wide range of offences from homicide to minor thefts and criminal damage.

Replicate

A replicate is a record on The National DNA Database relating to the same individual as another record, resulting from another sample having been taken from the individual on a separate occasion.

SGM Plus®

SGM Plus® is the DNA profiling system in current use for The National DNA Database. This system is compatible with SGM, but more discriminating. It allows the simultaneous analysis of the 12 SGM markers and an additional 8 markers from four further non-coding regions of DNA to give a DNA profile with a match probability of less than 1 in 1,000 million.

SGM Plus® is a registered trademark of Applied Biosystems

Short Tandem Repeat (STR)

A short length of the non-coding region of DNA that is repeated, end to end. Different people will have different numbers of these repeats and hence different lengths of repeated DNA. The STR profiling technique examines the lengths of these repeat units and converts the lengths into a digital output.

Speculative Searching

The process for searching The National DNA Database with a DNA profile obtained from a subject or crime scene to identify matches with DNA profiles already on the Database. Speculative searching is the term used within the original legislation that enabled The National DNA Database to be established, the Criminal Justice and Public Order Act 2004. It is carried out automatically as new profiles are added to the Database or, where the profile does not meet the requirements for loading, on a one-off basis against a snapshot of the Database.

Supplier

Any organisation, or unit of an organisation, which is authorised by ACPO to load DNA profiles to The National DNA Database.

Stub records

The demographic details relating to the PACE samples taken and recorded on PNC and transmitted to the Database. These include the kit bar code number, Arrest Summons Number(ASN), name, sex, date of birth, ethnic appearance and sampling force details.

Unexpected Results

Results that are suspected to be in error and are required to be investigated.

UKAS

United Kingdom Accreditation Service

Volunteer

An individual who consents to provide a DNA sample for used in a specific investigation for elimination purposes and who may give separate consent for its loading to and permanent retention on The National DNA Database.

Y-STR

A short tandem repeat contained in the male Y chromosome in nuclear DNA.

DNA Operations Group and Suppliers Group representatives

DNA Operations Group representatives 2004/05

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Secretariat

Mr Nicholas Apps, DNA & Fingerprint Retention Project Researcher

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Notes

