National DNA Database Ethics Group

Notes of the 34th meeting held on 7 June 2016 at

Home Office, 2, Marsham Street, Westminster, London, SW1P 2DF

1.0 Welcome and Introductions

1.1. The Chair welcomed all to the 34th meeting of the National DNA Database (NDNAD) Ethics Group (EG). Apologies had been received from Daniele Bryden, Christopher Harling Adil Akram and Alan Clamp. Danielle Bryden had stepped down as a member of the Ethics Group and the Chair expressed thanks for her contributions to the group.

1.2. The Chair also welcomed Lisa Hall, Fingerprint consultant at the Metropolitan Police Service; Gemma Gyles, Office of the Biometrics Commissioner; June Guiness, Forensic Science Regulation Unit, Home Office; Andrew Thomson, National DNA Database Delivery Unit (NDU), Home Office; Andy Derwent and Sara Featherstone Crime, Policing and Fire Group, Home Office.

1.3. The Chair requested that members declare any conflicts of interest with agenda items as they arise.

2.0 Note of the Previous Meeting and Matters Arising

2.1 The note of the previous meeting had been approved via correspondence and published on the EG website.

2.2 Matters arising were discussed:

Action 3: Invite the policy leads from the Custody Image Review team to the June EG meeting to provide an update on the conclusions form the review. The Home Office had entered purdah due to the European Union Referendum and therefore the Custody Image Review would not be published before 24 June 2016. The Secretariat would inform the EG when the review was published.

Action 5: Secretariat to investigate whether the EG could reflect on the lessons learnt from the Rapid DNA work from an ethical point of view at the next meeting. The Secretariat had contacted colleagues in the Centre for Applied Science and Technology (CAST) and was informed that a number of workshops had been held to identify lessons to be learnt and that these would feed into a report on Rapid DNA. CAST had requested that the EG consider the Rapid DNA report once complete.

Action 4, from the meeting on 27 November 2015: Shazia Khan to provide evaluation of the Metropolitan Police Service (MPS) Y-STR pilot when complete. The evaluation is still in progress and will be provided once complete.

2.3 All the other actions were complete or were agenda items for the current meeting.

3.0 Remit of the Forensics and Biometrics Ethics Group

3.1 Members were provided with a paper which outlined that the EG will be expanded and become the Forensics & Biometrics Ethics Group providing ethical advice to the Home Office. Members were invited to make recommendations as to which areas should fall within the remit of the new EG, identify gaps and prioritise work.

3.2 A paper had been provided which highlighted the areas of forensics and biometrics which were expected to be high priority for the Home Office over the coming years along with specific details of Home Office projects or policy areas which were planned or in progress.

3.3 Whilst members agreed that fingerprints should be included within the remit of the new group they were clear that care should be taken not to impinge upon the remit of the Forensic Science Regulator (FSR) who is responsible for setting quality standards in this area. It was suggested that the terms of reference for biometric identification should be kept sufficiently broad to enable the inclusion of new methodologies as their potential for use develops e.g. ear printing and ridge details on the soles of feet.

3.4 Members queried whether the Home Office had developed an overarching ethical document covering all its policy areas and those present were not aware of such a document. Members thought it would be helpful for the terms 'forensics' and 'biometrics' to be defined and it was suggested that these definitions should be taken from the forensics and biometrics strategies respectively.

3.5 There was agreement that inevitably there would be cross-over of work between the EG and the work of Independent Digital Ethics Group established by the National Police Chief's Council (NPCC) and it would be important for communication links to be established to ensure these groups work together to minimise overlap.

Action 1: Secretariat to apply the definition of 'biometrics' and 'forensics' from Home Office Strategies to developing the terms of reference of the new Forensics and Biometrics Ethics Group.

4.0 Ethical Dimensions of Next Generation Sequencing & other Ethical Assessments

4.1 Members had been provided with two papers on Next Generation Sequencing (NGS). The first paper included overarching ethical issues arising in connection with NGS. The second paper was an academic paper on the ethical dimensions of NGS written by Barbara Prainsack and other colleagues from Kings College London (KCL). Members were invited to consider whether the papers should be published on the EG website and to agree the list of stakeholders provided.

4.2 It was clarified that the first paper of overarching ethical issues had been undertaken as a mapping exercise and did not attempt to suggest ways for

addressing specific issues. Going forward, the EG may wish to discuss where its efforts should be focused in order to address the most pressing concerns.

4.3 The EG provided views on the document containing the overarching ethical issues and noted the need for improved clarity throughout in relation to public and private harms and benefits. In some situations the most obvious benefits had been missed out. It was suggested that a glossary should be provided and that all the terms and acronyms should be defined, including Whole Genome Sequencing (WGS) and Whole Exon Sequencing (WES). Members agreed that it was not within the EGs remit to comment on how public money should be spent and that sections referring to expenditure should be omitted.

4.4 Concerning the second paper 'Ethical Dimensions of NGS', it was agreed that this should be published on the EG website in light of it being a key document in the development of the EGs overarching ethical issues paper. It was agreed that, in line with the EGs independence, all conflicts of interest should be included and that it would be necessary for the document to clearly state that it is an independent piece of work prepared by a group of scholars (one of whom is on the EG) which was requested by the EG but does not reflect the views of the EG as a whole.

4.6 Members agreed that both documents should be circulated to a group of stakeholders for comments and views on priorities prior to them being published on the EG. Consumer groups should be included in the list of stakeholders as well as the European Forensic Genetics Network of Excellence (EuroForGen) and the FSR DNA Analysis Specialist Group.

4.7 Discussions turned to the development of a statement of broad principles for ethical reviews and the likelihood that such a statement would be similar as to that provided in the overarching NGS issues paper. It was agreed that when sending out the NGS papers for consultation, the EG should note its intention to utilise a similar approach for considering wider ethical issues in the future and request feedback on this proposal.

Action 2: Adjustments to be made to the two papers on Next Generation Sequencing and then they should be circulated to stakeholders for comments and views on prioritisation of work.

5.0 Ethical Issues with Y-STR elimination databases

5.1 The EG heard that the FSR's DNA Analysis Specialist Group was developing a standard for DNA profiling using Y-STR analysis and that Y-STR elimination databases would need to be established by Forensic Science Providers (FSPs). The development of Y-STR elimination databases might raise a number of ethical issues specific to Y-STR profiling that might not have been previously considered. These include;

- Providing information about biological relationships. Male relatives, such as brothers, can expect to share almost identical Y-STR profiles and resulting profiles taken from two brothers who worked at the same FSP or police force

would very obviously identify if the individuals did not share the same biological father.

- Providing information about male fertility problems. Associations have been identified between certain combinations of missing and/or duplicated Y-STR alleles and male fertility problems. In an otherwise high quality profile, certain combinations of alleles may indicate a deletion of part of the Y chromosome and the possibility that an individual might have fertility problems. Consideration should be given to whether information should be fed back if such a profile were obtained arising from an individual who was profiled for inclusion onto a staff Y-STR elimination database.
- How to approach Y-STR profiling of transgender individuals as those individuals who have transitioned to or identify as female, yet genetically have XY chromosomes will need to be included on the Y-STR databases whilst those who have transitioned to or identify as male, yet genetically have XX chromosomes will not need to be included on the Y-STR elimination database.

5.2 The EG were reminded that the current practice, when undertaking DNA profiling of samples taken from staff for inclusion on elimination databases, is not to feedback when results could potentially provide information about an individual's health and to store that information on the databases in such a way as to prevent diagnosis of a condition from the stored DNA profile[1]. However, when undertaking Y-STR profiling, certain haplotypes might be linked with a propensity for a certain medical condition, which would be apparent when viewing the Y-STR profile.

5.3 The EG were strongly in favour of not feeding back health information on the grounds that it would be irresponsible due to the information only being presumptive[2] rather than predictive or diagnostic and it would be necessary to ensure that the Y-STR profile data was kept confidential and personal details kept separate. However, the EG did suggest that the collection of profiles for Y-STR elimination databases might provide an opportunity for research into the likelihood of Azoospermia, given the presence of certain Y-STR haplotypes. It was suggested that the consent forms which are used when individuals donate a DNA samples to be profiled for inclusion on elimination databases should be used to deal with this issue and the form should clearly state that any health information obtained would not be fed-back to the individual concerned. The EG thought that individuals needed to be made aware of these issues prior to giving their consent and also that giving consent should include the option not to have to donate a sample for Y-STR profiling. Whilst it would be the responsibility of FSPs to develop their own consent forms, the FSR may be able to provide guidance as to what should be included in those forms.

[1] When an individual presents with a trisomy (an extra copy of a chromosome) at amelogenin (a gene located on the sex chromosomes) such as Klinefelter syndrome (where male individuals have an extra copy of the X chromosome as well as the Y chromosome), the additional allele is recorded as an R on the databases indicating a rare allele rather than the true value of the allele to prevent diagnosis of the condition from the DNA profile.

[2] A presumptive genetic test (also known as a susceptibility or pre-dispositional health tests) provides an indication of the absolute lifetime risk and/or relative risk of an individual developing a condition compared with the general population.

5.4 It was noted that in the future, autosomal and Y-STR profiling might reveal information which is more medically significant or current information may become more medically significant. Whilst the current focus should be on keeping this information secure, in the future these issues are likely to require greater ethical consideration.

5.5 Members considered what guidance they could pass on to the FSR in relation to FSPs requesting transgender individuals to provide DNA samples for inclusion on Y-STR elimination databases. The EG were mindful that the FSR should not make recommendations that might lead FSPs to be discriminatory in their treatment of transgender individuals. It was suggested that a sensible approach would be for FSPs to be transparent with individuals when they are recruited that they may be asked to provide a DNA sample for inclusion on a Y-STR elimination database and it should be explained that both autosomal and Y-STR profiling will provide information about an individuals chromosomal status. Also, the importance of preventing contamination should be raised, and the requirement for all individuals with a Y chromosome who work on cases involving Y-STR analysis to be included on the Y-STR elimination database.

Action 3: Secretariat to feedback to the FSR the EG views on Y-STR elimination databases.

6.0 Fingerprint Identification presentation

6.1 Members heard a presentation on Fingerprint Identification by Lisa Hall, a Fingerprint Consultant from the MPS.

6.2 The MPS employed 144 fingerprint examiners. Demand for expertise varied according to crime type, given certain crimes were more likely to result in fingerprint evidence. Members heard that the standards which must be adhered to for fingerprint identification included;

- ISO 9001 for scenes of crime officers but who were also working towards gaining accreditation for ISO 17020;
- The physical and chemical enhancement laboratories were accredited to ISO 17025 supplemented by a draft FSR appendix to the codes of practice and conduct;
- Fingerprint comparisons accreditation was currently to ISO 9001 but they were working towards ISO 17025 accreditation and again have a Forensic Regulators appendix to the codes.

6.3 Members were informed that it was generally accepted, although not proven, that fingerprints were unique, no two individuals, including identical twins, have ever been found to have the same fingerprints. The principles of identification used the examination process known as the ACE-V process which includes analysis, comparison, evaluation and verification. The process of comparison relies on the objective observation and analysis of the available ridge detail with subjective interpretation and evaluation based on the training and experience of the examiner. The process is not linear and stages can be repeated before making definitive conclusions.

6.4 New reporting outcomes, introduced by the FSR, enabled fingerprint practitioners to report their outcomes as an identification (a positive result), an exclusion (a negative result), an inconclusive result and an insufficient result. The outcome was expressed as an opinion, not as a probability, and was a subjective decision based on the knowledge and competency of the practitioner.

6.5 IDENT1 is the UK fingerprint database used for searching and comparing fingerprint biometrics. A minimum of 8 characteristics were required to launch a search. IDENT1 was not able to make identifications, however, it provided the top most similar respondents. To complete the search a practitioner then examined the returns. In only 50-60% of the time was the actual match returned. When comparing 10 prints from an individual it becomes 98% accurate. The system does not automatically search, it only searches when a new search is launched.

6.6 A number of concerns in relation to fingerprint identification were raised;

- Fingerprints are retained and deleted according to the provisions within the Protection of Freedoms Act (PoFA) 2012 and the appropriate consent must be obtained to search a set of fingerprints on IDENT1;
- Individuals arriving in the UK from outside Europe must provide fingerprints for visa purposes. These prints are subsequently searched across the UK crime fingerprints database and the Federal Bureau of Investigation watch list. Individuals may not be aware of the searches undertaken;
- Most fingerprint bureaus do not conduct elimination checks before searching and filing ridge details on to the database.

6.7 Possible further ethical issues included, for example, whether identification should be done without human intervention, international exchange and sharing of data and whether the current mechanism for testing equipment and technology on current live databases is ethical (as those individuals included on the live databases are unlikely to have given their permission for their profiles to be used for the testing of equipment and technology).

6.8 It was queried whether the verification process, whereby a second independent examiner repeats the analysis, comparison and evaluation stages, introduces the potential for suggestion bias given they are aware of the first examiner's outcome. It was noted that in high risk situations or when results are challenged, individuals were requested to review prints independently of each other and all contextual information. This method was time consuming and cannot be achieved in all cases.

6.9 Due to the levels of human judgement involved in fingerprint identification, it was suggested that there was the potential for error. Mechanisms have been put in place to mitigate against errors and validate processes. Having the right culture, so that practitioners felt comfortable in reporting when an error had occurred, was also essential.

7.0 Memorandum of Understanding between the Home Office, the Department for Work & Pensions and the NPCC – DNA paternity testing for child maintenance cases

7.1 A paper was presented by the Crime, Policing and Fire Group (CPFG) within the Home Office which outlined details of a Memorandum of Understanding (MoU) which had been drawn up between the NDU within the Home Office, the Department for Work and Pensions (DWP) and the NPCC to use information obtained from DNA profiles to facilitate the investigation of fraud in child maintenance cases.

7.2 In cases where the biological parentage of a child was disputed, as part of an assessment to determine whether an alleged non-resident parent should be liable for paying child maintenance, the alleged non-resident parent was requested to provide a DNA sample. The DNA sample was taken by a medical practitioner with identification papers and a photograph provided. The parent caring for the child and the child themselves were also requested to provide DNA samples. Analysis of the three DNA samples determined the probability of the alleged non-resident parent being the biological parent of the child. The DNA testing either excluded the alleged non-resident parent as the biological parent of the child or provided a statistical likelihood of biological parentage.

7.3 In cases of suspected fraud e.g. in which DNA testing excluded the alleged non-resident parent as the biological parent but there was evidence to suggest the alleged non-resident parent was the biological parent (e.g the parent caring for the child provided a statement that the photograph of the person who gave the DNA sample was not the alleged non-resident parent), the DWP would approach the police, and if the police agreed they could arrest the alleged non-resident parent for fraud and take a DNA sample from the individual under the Police and Criminal Evidence Act 1984 (PACE). The PACE sample would be sent to the police force's FSP, profiled and loaded to the NDNAD. The police also required that the NDU released the PACE DNA profile and sent it to the laboratory which profiled the original DNA sample from the alleged non-resident parent for comparison. If the profiles did not match this provided evidence that the alleged non-resident parent did not provide the first DNA profile and that fraud had been committed. The DWP would decide whether to submit the case to the Crown Prosecution Service. In addition, they would request the NDU to undertake a non-routine speculative search of the NDNAD of the first DNA profile taken in order to establish the alleged parent's impersonator. Any matches on the NDNAD would be passed to the police to investigate for fraud.

7.4 The EG were supportive of the MoU as a tool to facilitate the investigation of fraud in child maintenance cases. They suggested the need for clear justification that fraud was suspected to have occurred in order for the alleged non-resident parent to be arrested and to provide a PACE sample, however this would be for the police to establish. The EG also suggested that the first DNA sample could be loaded to the NDNAD rather than speculatively searched against it, as the DNA sample could become a crime stain as it had been taken along with a statement of falsehoods in relation to its nature and provenance.

Action 4: Secretariat to feedback to the Home Office policy team, the EG views on the Memorandum of Understanding between the Home Office and the Department for Work and Pensions.

8.0 DNA Database Delivery Update and review of leaflet to accompany consent form

8.1 The NDU had produced a draft of a leaflet entitled 'DNA samples – your rights', to be given to individuals when they have a DNA sample taken for DNA profiling. The NDU sought comments from EG on the leaflet itself and appropriate ways to disseminate it.

8.2 Members noted a number of errors (grammatical, typographical and factual) within the leaflet. It was suggested that in attempting to be applicable to multiple scenarios and diverse audiences the message had become confused, particularly in relation to whether consent was required when a DNA sample was provided.

8.3 The EG thought that the leaflet ought to be designed and written so that it was readily intelligible by a young audience and those with a limited understanding of English.

Action 5: Secretariat to feedback to the NDU the EG comments on the draft leaflet 'DNA samples – your rights'.

9.0 Ethics Group Annual Report (2015) sign off and review of outstanding recommendations

9.1 Members had been provided with the EG annual report for 2015 and agreed that the report could be signed off for publication.

Action 6: Secretariat to publish the Ethics Group Annual Report for 2015.

9.2 Members had been provided with a table of outstanding recommendations made by the EG in its previous annual reports along with any progress which had been made. Members were invited to consider which recommendations might now be considered as complete and to indicate how outstanding recommendations might be progressed.

9.3 Each recommendation was considered in turn:

The benefits of an independent audit and scrutiny of the Counter-Terrorism (CT) DNA Database (CTDNAD) should be explored by the Home Office and the Metropolitan Police.

- This recommendation was considered outstanding. CT falls within the remit of the Biometrics Commissioner (BC) and the out-going BC had published in

his annual report the lack of implementation of the PoFA in respect to CT. Members agreed to discuss this issue with the new BC once appointed.

In order to promote a better understanding of the sources of error around the forensic use of DNA and to support systematic work around error reduction, a systematic review of error rates in the collection and forensic use of DNA in the criminal justice system should be carried out.

- This recommendation was considered complete. The EG considered the establishment of an expert network to 'Identify risks to the DNA supply chain' and the expected guidance for those who handle crime scene samples to be appropriate. The EG will comment on the outputs from this work and the effectiveness will need to be monitored in the future.

Following the introduction of Y-STR allele profiling, the use of these profiles should be monitored and an ethical impact analysis should be carried out.

- This recommendation was considered outstanding. The EG will monitor the progress of Y-STR profiling with the MPS and will review a report on the outcomes of the initial work.

Informed public consultation and debate about ethical issues arising from the profiling and storage of Y-STR alleles should be prioritised and facilitated.

- This recommendation was considered outstanding. Once the MPS has reported on their Y-STR trial the EG will consider what public debate could be promoted.

Efforts should be made to purge the NDNAD of contamination profiles.

- This recommendation was considered complete. The EG welcomes the work to eliminate contamination profiles from serving police officer and it will review the position when the DNA Database Strategy Board (SB) reports on the outcome of the exercise.

The Home Office should collate evidence on rape cases where a DNA match led to a conviction.

- This recommendation was considered outstanding. The EG will review it again once the Home Office has reported on its research in this area.

All databases containing DNA information, including the CT database, held by the police service should be subject to a robust statutory governance framework, appropriate systems and controls, and should be transparent and only be used for statutory purposes.

- This recommendation should be subsumed under the recommendation 'The benefits of an independent audit and scrutiny of the Counter-Terrorism (CT) DNA Database (CTDNAD) should be explored by the Home Office and the Metropolitan Police'.

To urgently improve the level of easily available and assimilated public information on the use of forensic DNA.

- This recommendation was considered complete. The SB annual reports contain a high level of detail. The EG will encourage the SB and the Home Office to ensure that information is readily available to the public.

Improvement of the process for taking consent and providing a better consent form for adult volunteers.

- This recommendation was considered complete. The consent forms have been updated and the EG have provided their views on these. The information leaflet is in progress and the EG will review a final version.

Action 7: Secretariat to keep under review outstanding EG recommendations and include them in the agenda for meetings at appropriate intervals.

10.0 Chair's update

10.1 The Chair had taken part in a Forensic Policy Group meeting on 6 June organised by the Home Office. This group brought together representatives from police forces, FSPs, academics and directors of forensic services with the aim of producing a more coordinated approach to forensic science and improving efficiencies within the system. The Chair had emphasised the need for appropriate governance structures for forensic science and the necessity for the EG to be allowed to comment on Privacy Impact Assessments at an early stage rather than during formal consultation processes.

10.2 The Chair hoped to meet with the NPCC Forensics Lead, Chief Constable Debbie Simpson.

11.0 Biometrics Commissioner's(BC's) update

11.1 Alastair MacGregor's term as the BC had ended on 31 May 2016 and his replacement would be announced shortly. Alastair had recently raised concerns that cross searching between databases in order to make policing faster and more efficient had the potential to erode the firewalls between the various databases.

12.2 The BC had published a report, subsequent to his annual report, which considered the issues of the CT databases and the management of DNA samples and profiles and fingerprints, taken as a result of CT investigations.

Action 8: Secretariat to circulate to EG members the Biometrics Commissioners report on the Counter-Terrorism DNA database.

12.0 Forensic Science Regulator's update

12.1 The following updates were provided to EG on behalf of the FSR. The FSR had held a workshop on ‘DNA anti-contamination – crime scene evidence recovery’ on 19 May 2016.

12.2 The DNA specialist group had commenced working on a draft of the DNA mixtures guidance and related software validation guidance. A first draft was due in August 2016. The documents was to be circulated to the EG for comment when ready.

12.3 Full anti-contamination guidance was being drafted for Sexual Assault Referral Centres (SARC) and custody suites. Meanwhile interim guidance for SARCs had been published to provide urgent recommendations on particular contamination issues. A contamination incident in a SARC had been reported to the FSR, who had investigated the incident and would provide an initial root cause analysis.

12.4 The DNA Analysis Specialist Group were developing standards for DNA Y-STR analysis. The group faced the major challenge of finding the resources and skills to develop a UK focused Y-STR haplotype database and the development of software to interpret mixed Y-STR profiles.

12.5 The FSR was producing guidance on standards for fingerprint analysis and the EG were invited to review copies if they wished.

13.0 AOB

13.1 Date of next meeting: 13 September 2016.

Annex A

Attendees

Chris Hughes	Chair
Nina Hallowell	Member
David Latchman	Member
Carole Moore	Member
Isabel Nisbet	Member
Barbara Prainsack (via teleconference)	Member
Jennifer Temkin	Member

Apologies

Adil Akram	Member
Daniele Bryden	Member
Alan Clamp	Member
Kit Harling	Member

In attendance

Emma Burton-Graham	NDNAD EG Secretary
Andy Derwent	Crime, Policing and Fire Group, Home Office
Sara Featherstone	Crime, Policing and Fire Group, Home Office
June Guiness	Forensic Science Regulation Unit, Home Office
Gemma Gyles	Biometrics Commissioner's Office
Lisa Hall	Fingerprint Consultant, Metropolitan Police Service
Mike Taylor	NDNAD EG Secretariat
Andrew Thompson	NDNAD Unit, Home Office
Jo Wallace	Head of the Science Secretariat, Home Office

Annex B:

GLOSSARY OF TERMS

Biometric Information	Information about an individual's physical characteristics such as fingerprints or eye colour, which are distinctive and measureable.
Biometrics Commissioner	Independently appointed post to provide oversight of the regime established by the Protection of Freedoms Act to govern the retention and use by the police in England and Wales of DNA samples, DNA profiles and fingerprints. The post has a UK-wide oversight function as regards their retention and use by the police on national security grounds.
Central Elimination DNA Database (CED)	A centrally held database of DNA profiles taken from individuals who are involved in a role where there is a increased risk that they may inadvertently contaminate a sample taken from a crime scene with their own DNA, such as manufacturing or laboratory staff, crime scene officers and police personnel.
College of Policing	The professional body for policing which operates in the public interest to find the best ways to deliver policing and support for the police service.
Counter Terrorism (CT) DNA Database	A DNA database operated by the Metropolitan Police Service which contains the DNA profiles obtained through searches, crime scenes and arrests in relation to counter terrorism.
Crime Scene Stain	Biological material recovered from the scene of a crime from which DNA may be able to be extracted.
Criminal Justice Sample	A sample of DNA obtained compulsorily from people arrested by the police for a recordable offence under the provisions of the Police and Criminal Evidence Act 1984.
Crown Prosecution Service (CPS)	Established in 1986, it prosecutes criminal cases investigated by the police in England and Wales. It advises police, reviews cases submitted by the police and prepares and presents papers for cases in court.
Custody Images Review (CIR)	Review by the Home Office to consider proportionality of the use and retention of images on a national database.
Dactyloscopy	The method of ridge analysis in human skin (typically fingers and palms) *[See also Fingerprints]*
Data Linkage	A process which brings together two or more sets of data from different databases, organisations or countries to enhance the information that can be obtained from the data (e.g. by combining different datasets, new patterns may become apparent)
Deoxyribonucleic Acid (DNA)	The chemical in the cells of an organism that carries that organism's heritable material used in the development, functioning and reproduction of all known living

	organisms. DNA is a nucleic acid and consists of two strands coiled around each other to form a DNA double helix. Each DNA strand is composed of smaller units called nucleotides and the sequence of these nucleotides encodes biological information.
DNA Profile	A numerical representation of the characteristics of certain sections of (typically non-coding) DNA obtained following the analysis of a DNA sample which can be uploaded to a database and compared with other DNA profiles.
DNA 17 Profile	A profile produced using the latest system of DNA profiling technology which examines 16 sections of DNA, plus a gender marker to produce a numerical DNA profile that can be loaded onto the National DNA Database. The methodology used creates greater discrimination between profiles than the previous SGM + methodology and reduces the probability of chance matches between individuals.
Elimination DNA sample	A DNA sample taken from an individual and used to create a DNA profile in order for that individual to be eliminated as the source of a sample found at a crime scene *[see also Central Elimination DNA Database]*
Epigenetics	This is the study of (partly heritable) changes in gene expression due to external or environmental factors that affect how genes are read, rather than changes in the underlying DNA sequence.
Facial Recognition System	A computer application capable of identifying or verifying a person from a digital image or a video source by comparing selected facial features from the image with those on a facial database.
Familial Searching	Involves searching the database for DNA profiles that do not match fully to a comparison profile, but where an unusually high number of loci match. This could indicate a biological relationship such as parent, child, sibling, cousin, uncle etc.
Fingerprints	The impression left by the epidermal ridges in a human finger. The print consists of a mixture of sweat and skin cells. *[See also Dactyloscopy]*
Forensic Science Regulator (FSR)	Ensures that the provision of forensic services across the criminal justice system is subject to an appropriate regime of scientific quality standards. The FSR works with the Home Office.
International Standards Organisation (ISO)	Is an independent, non-governmental international organisation. It brings together experts to share knowledge and develop international standards that are voluntary, consensus-based and market relevant.

Low copy number (LCN)	A modified version of DNA profiling that is performed when the amount of DNA recovered from a biological sample is very limited. The number of PCR cycles is increased compared to standard SGM plus, which enhances the sensitivity of the technique and improves the likelihood of detecting DNA.
Random Match Probability	The probability that a DNA profile matches a randomly drawn person from the general population. If the random match probability is high, then any suspected link between the DNA and a person needs to be treated with caution.
Metagenomics	Is the study of the diversity of species in a microbial sample which has been recovered from the environment. It allows the study of all genes in all organisms which are present in a given complex sample.
Mixed DNA Profile	A profile where DNA from more than one individual is present. A mixed DNA profile is evident when more than two copies of DNA are observed at a region. *[See also DNA profile]*
National Crime Agency	Leads the UK law enforcement's fight to cut serious and organised crime. It has national and international reach and the mandate to work in partnership with other law enforcement organisations to tackle serious and organised criminals.
National DNA Database (NDNAD)	Established in 1995, it is an electronic, centralised database holding the DNA profiles taken from both individuals and crime scenes. The database can be searched to provide police with a match linking an individual to a crime scene and *vice versa*.
National DNA Database Delivery Unit (NDU)	A department within the Home Office responsible for overseeing the running of the National DNA Database.
National DNA Database Strategy Board (NDNAD SB)	A board comprising representatives from ACPO, the Home Office, the DNA Ethics Group and the Forensic Science Regulator as well as representatives from other bodies that provides governance and oversight for the operation of the NDNAD.
National Police Chiefs Council (NPCC)	The NPCC bring together the 43 operationally independent and locally accountable chief constables and their chief officer teams to coordinate national operational policing. They work closely with the College of Policing.
Next Generation Sequencing (NGS) or Massive Parallel Sequencing (MPS)	This is the terms used to describe a number of high throughput approaches to DNA sequencing that allow the sequencing of DNA much more rapidly and cheaper than previously.

ParaDNA® Instrument	An instrument that can be used at a crime scene and is able to produce a DNA profile from a sample within 75 minutes. ParaDNA® profiles include 5 STRs and a gender test and therefore the discrimination power provided from these profiles are much less than obtained from full SGM+ and DNA17 profiles. *[See also Rapid DNA Technology]*
Partial DNA Profile	This is the term used to describe a profile when results have been obtained at some but not all of the sections of DNA which were analysed. Partial profiles are often obtained from samples recovered from crime scenes as the DNA may have been subject to conditions which have degraded it, which means that not all regions of DNA of interest are intact.
Phenotype	The physical manifestation of an individual's genotype combined with the effects of exposure to environmental factors (e.g. the hair colour, facial features, or personality traits of a person)
Phenotypic profiling	The use of DNA analysis in order to obtain information about externally visible traits, and/or the likely ethnic background, of a person. The information cannot be obtained from traditional STR profiles but requires a special type of analysis.
Protection of Freedoms Act (PoFA)	An Act of Parliament of the UK which was introduced by the Home Secretary in 2011 and sponsored by the Home Office. In May 2012 the Bill completed its passage through Parliament and received Royal Assent.
Prum Agreement/ Convention	A convention sign in May 2005 by Austria, Belgium, France, Germany, Luxemburg, the Netherlands and Spain and is open to all members of Europe and enables the signatories to be able to exchange data regarding DNA, fingerprints and vehicle registrations of persons suspected to be co-operating in terrorism, cross-border crime and illegal migration.
Rapid DNA Technology	Technology which has the ability to produce a DNA profile much faster than can be done using conventional technology and is also portable.
S and Marper	This refers to a case where S joined with Marper to bring a case to the European Court of Human Rights after their applications to the English courts had failed. They objected to the retention by the police of their DNA samples, profiles and fingerprints as they had not been convicted of any offence. The police were entitled to retain them under the law then in force. S and Marper relied principally on Section 8 of the European Convention of Human Rights which protects the right to privacy. The Court found in their favour. It held that the margin of appreciation had been exceeded and their right to privacy had been infringed. This decision led eventually to the passing of the Protection of Freedoms

	Act 2012 which changed the law on the retention of samples, profiles and fingerprints. This in turn led to the removal of millions of profiles from the National DNA Database.
Second generation multiplex (SGM, SGM+)	A system of DNA profiling which was used in the UK until July 2014 which examines 10 sections of DNA plus a gender marker to produce a numerical DNA profile that can be loaded onto the National DNA Database. At each of the 10 areas an individual has two copies of DNA, one inherited from each of their parents.
Short Tandem Repeat (STR)	Sections of DNA dispersed within coding and non-coding regions of the human genome that contain hundreds of repeats of a short sequence of DNA (2-6 nucleotides). Different people have different numbers of repeats and when a number of regions are analysed, the chance of two people having the same number of repeats at all loci is small. This is the underlying principle of DNA profiling.
Single Nucleotide Polymorphism (also referred to as SNPs – pronounced “snips”	This is a variation at the level of single nucleotide bases that occurs at a specific position in a sequence of DNA.
United Kingdom Accreditation Service (UKAS)	Is the national accreditation body for the UK and is recognised by government to assess against internationally agreed standards, organisations that provide certification, testing, inspection and calibration services.
Y-STR profile	*See STR profile* but restricted to regions found only on the Y-chromosome (which is only present in males).