



ACPO

DNA GOOD PRACTICE MANUAL

Second Edition 2005

FOREWORD

The strategic vision of the Forensic Integration Strategy is:

- The optimal use of forensic science and technology to reduce crime, bring more offenders to justice and increase public confidence.

When DNA is recovered from a domestic burglary crime scene the detection rate increases significantly. The use of legislation, allowing DNA to be taken from a person arrested for a recordable offence, has resulted in more persons being profiled and several matches to previously unsolved, serious crime scene stains, including murder and rape.

This Good Practice Guide is intended to help you get the most out of DNA and improve our ability to reduce crime, bring more offenders to justice and increase public confidence.

The Guide provides good practice in recovering, handling and matching DNA samples between scenes and suspects, and using that information to demonstrate a suspect's guilt.

In the future this document will be complimented by guidance being developed by the National Centre for Policing Excellence, in relation to practice advice for police officers in the effective use of physical evidence as an aid to crime investigation.

The aim of this practical guide is it to improve the knowledge and awareness of our staff. It has been written with the help of a wide range of people and I would like to extend my thanks to them.

I would really welcome your feedback on this guide, together with any practical advice or issues of good practice that you would like to be included in the future.

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1.0 INTRODUCTION

1.1 Objectives

This manual provides operational guidance in using DNA for the detection and prosecution of offenders. Current good practice is set out so that police in every force use the technology successfully to solve crimes and gather criminal intelligence.

The guidance is for the use of members of police forces, and for the information of forensic science providers (FSPs) and the Crown Prosecution Service (CPS). Failure to comply with the guidance may reduce the effectiveness of police investigations.

1.2 The benefits of using DNA sampling

DNA helps police link offenders to crime scenes by matching DNA profiles that have been stored in the National DNA database (NDNAD) to DNA samples taken from crime scenes or suspects. It can also be used to eliminate suspects from enquiries.

The success of the system relies on the quality of the samples secured by the police and laboratories for profiling and complemented by public confidence in the integrity of the information held in NDNAD. Failure to follow agreed and published procedures, in terms of how, when and where samples are collected, managed and administered will undermine the value of DNA samples.

1.3 What is DNA?

DNA (Deoxyribo-Nucleic Acid) is a molecule found in the cells of all people, animals, plants, and other organic matter. The cells are the building blocks of any living organism, of which the human body has countless millions.

Cells are contained within many different types of tissue e.g. skin, muscle, blood etc., and inside the majority of cells is a nucleus that contains the 'vehicles' of inheritance - the chromosomes.

In human beings, for all forensic purposes, every cell contains DNA. Each DNA molecule has a double-helix structure, which carries the genetic code or "building instructions" for an individual human body.

The chemical structure of DNA embodies a genetic code, made up of only four repeating units - the repeats interlock like the teeth of a zip fastener.

Variations in the DNA code are responsible for physical differences between individuals including sex, height, hair and eye colour etc.

The DNA pattern for each person, save for genuinely identical twins, is believed to be unique. Half of a person's DNA is inherited from their mother and half from their father. Children will inherit different combinations of DNA from the same parents and therefore will have different DNA from each other. However, children within one family are more likely to have similar DNA than unrelated individuals.

It is this uniqueness and the ability to create a digital profile from it that makes the use of DNA so important in matching people to places and offenders to scenes. Scientists have long recognised the fact that if they could demonstrate the differences in the chemical sequence of the DNA molecule this would give access to a powerful way of identifying individuals.

1.4 Short Tandem Repeat profiling (STR)

The most common technique of DNA analysis is known as short tandem repeats (STR) profiling. The current method of STR profiling uses Second Generation Multiplex Plus (SGM+). This technique looks at specific short lengths of the DNA that are repeated, end-to-end, within the DNA molecule and makes millions of copies of them. Different people will have different numbers of repeats and hence different lengths of this repeated DNA. The STR profiling technique examines the lengths of the repeat units and converts the lengths into digital outputs, known as the DNA profile.

1.5 Low Copy Number (LCN) DNA analysis

LCN DNA analysis is an expansion on the SGM+ technique. It is used when the amount of DNA present is very low and many more copies of the DNA have to be made in order to obtain the DNA profile. This allows profiles to be obtained from traces that are too small to be seen with the naked eye, or are highly degraded. LCN DNA analysis is so sensitive that DNA can be recovered from the residue of a fingerprint (Section 3.4). However, because of the sensitivity of LCN analysis there is an increased risk of the result being affected by contamination.

In view of the complexities and cost implications of using LCN DNA analysis, each submission needs to be considered on a case-by-case basis and should be discussed with the force Scientific Support Unit.

1.6 Mitochondrial DNA

Unlike the DNA used for STR analysis, mitochondrial DNA is not found in the nucleus of cells, but in the mitochondria. It is associated with the energy production functions of the cell. Mitochondrial DNA is inherited solely down the maternal line.

Mitochondrial DNA analysis is very different from STR analysis, and the results are far less powerful for distinguishing between individuals (1 in 100 being a typical match probability). However, it can still be used to eliminate a suspect conclusively.

The main advantage of mitochondrial DNA is that it is less sensitive to factors such as age and environmental conditions. Therefore, it is particularly useful for analysing decomposed tissue and material from fires. It is also possible to use this technique to analyse samples such as faeces, bone and hair shafts, which cannot be analysed using STR methods.

Currently, the analysis of mitochondrial DNA is very time consuming and expensive. This, together with its relatively limited evidential value, will restrict its use in most routine investigations.

Mitochondrial DNA profiles are not comparable with STR profiles and therefore cannot be loaded onto the NDNAD.

Throughout this document, when DNA profiling or DNA analysis are mentioned it refers to DNA from within the nucleus of the cell and the technique of STR profiling (SGM+) - as opposed to Mitochondrial DNA or LCN DNA analysis.

Further information on techniques used for analysing DNA can be found in Appendix one.

1.7 Similarities with fingerprints

Identification by DNA matching is similar to identification by matching fingerprints. The advantage of fingerprint evidence from the police perspective is the clear visibility of the evidence to judges and juries.

Even though a crime scene may not produce fingerprints, it may still be rich in recoverable DNA material. In these cases, DNA sampling should be undertaken as it can be used instead of fingerprint evidence. DNA may also be valuable when there is fingerprint evidence, as it can provide additional information about the possible offender(s). Fingerprints and DNA can compliment each other, especially where the quality of either the DNA or the fingerprint is poor and therefore presenting both may provide conclusive evidence.

1.8 How DNA samples can be used for police purposes

DNA profiling can be used to assist in police enquiries and to bring criminal cases to court primarily in the following ways.

First, a sample of DNA found at a scene of crime can be compared with a sample taken from an individual suspected of committing the crime. If a “match” results, it can be used as evidence in court.

Second, samples taken from more than one crime scene may be linked together as a result of matches and so reveal a series of offences. This can provide useful information to be added to police intelligence systems and possibly be produced as evidence in court.

Third, people arrested for a recordable offence and detained in a police station are required to supply a DNA sample to be profiled and searched against other DNA profiles from scenes of unsolved crime. This is known as an Arrestee sample and is added to the NDNAD. The sample is normally taken in the custody suite of a police station.

DNA can also be used to identify offenders through their close relatives (see Appendix one) and to help identify deceased persons.

1.9 The National DNA Database® (NDNAD)

The NDNAD was established in 1995, under the authority of the Police and Criminal Evidence Act 1984 (PACE) as amended by the Criminal Justice and Police Act 1994.

The Custodian of the NDNAD acts on behalf of the Association of Chief Police Officers (ACPO). The Custodian is responsible for the integrity of the records held on the NDNAD and for notifying police forces of any matches generated by the NDNAD.

At present (April 2005), there are over 3 million records on the NDNAD from people and 240,000 records from unsolved crime scenes.

Approximately 45,000 DNA matches were obtained in 2003 - 2004 from the NDNAD. This led to over 20,000 “DNA detections” and a further 15,000 additional detections and crimes being taken in to consideration (TICs). In a typical week these equate to:

- 6 murders
- 15 sex offences
- 40 violent crimes
- 400 volume crimes
- 15 drugs crimes

Searches of the entire NDNAD are automatically carried out as new person profiles and crime scene (CS) profiles are added. For further information on DNA matches, see Section 6.0.

1.10 Limitations of DNA

Although the technology used for profiling DNA is extremely refined, it does not enable scientists to say with complete certainty that a DNA sample taken from an individual person is unique. As a result, a match is a matter of very high probability but not absolute certainty.

Therefore, evidence of a match between a cell sample recovered from a scene of crime and a DNA sample taken from a suspect can be compelling but not conclusive evidence on its own, of presence at the crime scene. A corroborative piece of evidence is needed to remove all doubt.

1.11 DNA frequency database

To evaluate the likelihood of any two DNA profiles matching just by chance, it is necessary to know the frequency with which the profile is likely to occur in the population and whether this is different for different ethnic groups within the population.

To obtain this information, DNA profiles are obtained from individuals of known ethnicity or from published reference data. These profiles remain anonymous and are used to create DNA frequency databases.

Three main frequency databases are used for estimating the probability of a match:

- Caucasian
- African-Caribbean
- Indo-Pakistani

If there is reliable information on the ethnic group of the individual, the most appropriate database will be used. If there is no reliable information about the origin of the offender, each of the three databases will be used and the one most likely to produce a match by chance will be reported.

1.12 Intelligence-led screens

When major crimes are being investigated, it is sometimes desirable to seek DNA samples on a voluntary basis, from a number of people who may possibly have some association with a crime or crime scene. This is principally with a view to eliminating them from the enquiry.

These samples are used only for comparison with the relevant crime scene(s) before being destroyed. However, the DNA profiles obtained from the samples given by these volunteers can be loaded onto the database but only with the written consent of the individual concerned. Once consent has been given, it cannot be withdrawn.

DNA samples taken in connection with major crimes are dealt with in the ACPO Murder Investigation Manual and Intelligence Led Screens: A manual of guidance, NCOF, 2004.

1.13 Contamination

Current DNA profiling methods are very sensitive. It is possible to detect very low levels of DNA, equivalent to approximately 50 cells and it is even possible to detect the DNA present in a single cell, although in practice several cells are commonly required. Because of this very high sensitivity, there is an increased chance of detecting DNA from more than one individual in samples. Some of this will be material legitimately left by previous or regular visitors to scenes. However, some may be material left by those attending the scene after an incident has been reported. This is known as contamination.

Contamination can adversely affect the ability of a laboratory to obtain a DNA profile and will preclude the profile being loaded to the NDNAD. Contamination can cause unnecessary and expensive enquiries to be made. ACPO has therefore issued guidance on practices the police should adopt to avoid contamination (see Appendix two, ACPO DNA Anti-contamination Guidelines).

1.14 Police elimination database

Whatever precautions are taken, it is not possible to eliminate the risk of contamination entirely.

To avoid time-wasting enquiries and to assist in the detection of contamination, the police and laboratories have developed elimination databases containing profiles of personnel who are in a position to cause contamination inadvertently.

The Police Elimination Database (PED) contains DNA profiles of police officers, crime scene investigators and police ancillary personnel. The profiles of most operational police officers are now included on the PED.

Since 1 April 2003, police regulations require all new police recruits to the service to provide a sample for the PED. This sample and the profile are retained for the period of their service with the police. Officers, who joined the police service before 1 April 2003, are asked to provide samples for the PED on a voluntary basis. These officers can request removal of their profiles from the PED at any time without giving any reason.

PED samples can be analysed by any accredited laboratory. They are then held by the Custodian of the NDNAD. The PED is entirely separate and distinct from the NDNAD.

A search of the PED can only be initiated at the request of a senior investigating officer (SIO) or a scientific support manager (SSM). The search is limited to comparing a profile from a named officer with a specific crime scene profile and when there is a genuine belief that contamination may have taken place. Speculative searches of profiles on the PED against profiles from unsolved crimes in order to identify contamination, or for any other purpose, are NOT permitted.

1.15 DNA success

The NDNAD has proved to be a very successful tool for the detection of crimes. Its effectiveness is likely to increase with more efficient processes for collecting samples.

The NDNAD annual report for 2003/04 states that there is a 45 per cent chance that a crime scene profile will match a person profile when it is first added to the NDNAD. The match rate rises to approximately 54 per cent as new person profiles are loaded to the NDNAD. Statistics further show that 80 per cent of matches between person profiles and CS profiles involve offences different from the initial arrest offence. Increasingly, sampling of individuals for minor offences has led to a growing number of matches linking the offender to serious crimes.

When DNA is recovered from domestic burglary crime scenes the detection rate increases from 15 to 46 per cent. The Home Office estimates that about 50 per cent of those detections led to convictions, with 25 per cent of offenders receiving custodial sentences. Each of these detections prevented a further 7.4 crimes being committed.

Recently there have been several changes in legislation to allow a greater number of DNA profiles to remain on the NDNAD. These include:

- DNA profiles from individuals who have been acquitted of crimes or where charges have been dropped
- DNA profiles from all individuals who have been arrested for a recordable offence
- DNA profiles from volunteers

The result of the changes in legislation has been to identify suspects for offences through NDNAD matches that would otherwise have remained undetected. These offences have included crimes such as murders, rapes and burglaries.

SECTION TWO

Crime scene preservation

2.0 CRIME SCENE PRESERVATION

Section two sets out good practice for those who take the initial call from the public and for officers who are first to attend the crime scene.

The topics covered include:

- Taking the initial call
- Crime scene preservation advice
- Responsibilities of the first officer attending a crime scene
- Attendance of a crime scene investigator
- Contamination
- Record of visitors to a crime scene

2.1 Taking the initial call

Whoever takes the initial call needs to be aware of the value of DNA material and the ease with which it can deteriorate or be lost, contaminated or destroyed.

In order to maximise the benefits from DNA, everything possible should be done to preserve and secure scenes by keeping legitimate access and contamination to a minimum. However, this should not override police responsibilities to preserve life.

If it appears that DNA material, such as blood, could be lost or destroyed by the items being discarded prior to police arrival (e.g. stained clothing being removed in hospital), the caller should be asked to take practical steps to preserve it.

2.2 Crime scene preservation advice

Callers should be asked to avoid or minimise disturbance at the scene in order to protect any physical evidence present e.g. fingerprints, footwear marks, fibres or any other materials that may have forensic value. This is of particular importance if there is reason to think that there are traces of blood, saliva, body fluids or hair present, as these can easily be contaminated through the presence of other people.

If it is not possible to leave the scene completely undisturbed, the caller should be advised **not** to:

- ✗ Expose themselves to any risk
- ✗ Walk over evidence such as broken glass, blood stains, or footwear marks
- ✗ Handle any items which have been touched or moved by the suspect
- ✗ Walk over areas where it is obvious the suspect has walked
- ✗ Touch or move anything unless it is absolutely necessary to do so to protect the item from the elements (If an item, such as blood on broken glass, has to be moved, the caller should be advised to handle it by the edges to ensure the surfaces are unspoilt)
- ✗ Wash or remove clothing, if the crime is violent or is of a sexual nature, until advised by the police or crime scene investigator (CSI).

A crime scene may include:

- A piece of land or part of a street
- A building or a room within a building
- The houses, vehicles, drinking vessels and other property of a suspect, witness, or victim
- Stolen or recovered property
- The body, personal possessions and clothing of a suspect, witness, or victim
- Ambulances or other vehicles used to convey victims or offenders to hospital premises, police stations or mortuaries.

All crime scenes can be useful sources of physical evidence – but it is important not to make unreasonable demands upon callers and others reporting crimes to preserve such evidence if the police are unable to make an early attendance at the scene. It may be necessary on occasions to ask for part of a scene to be protected from intrusion.

2.3 Responsibilities of the first officer attending the crime scene

When the first person attending the crime scene is a trained CSI, the collection of crime scene samples can start immediately. If this is not the case, the first person attending should seek to secure and preserve the scene for specialist examination at the earliest opportunity.

The first officer should:

- ✓ Find out when the CSI will arrive and inform the individual concerned
- ✓ Take care not to contaminate the scene
- ✓ Gather as much information as possible from the victim(s) or witness(es)
- ✓ Consider health and safety risks and ensure the victim and other personnel are not placed at risk from body fluids, broken glass, sharp objects, damaged electrics, poor lighting conditions, leaking gas or agitated victims, witnesses or suspects etc.
- ✓ Remember this does not affect an officer's first responsibility to preserve life.

The first officer should not:

- ✗ Approach or enter the crime scene unnecessarily
- ✗ Touch or move anything (unless to protect and preserve material)
- ✗ Try to conduct an inexperienced forensic examination.

2.4 Attendance of a crime scene investigator

For DNA rich crime scenes, good practice requires the early attendance of a CSI to counter the risks of deteriorating samples and contamination; this may require the CSI's investigation of other scenes of crime to take second place.

However, it is recommended that CSIs should always attend if the first officer in attendance determines that the crime involves:

- Violence, robbery, or a crime of a sexual nature.
- The burglary of a dwelling, including distraction type burglary offences when the victims are vulnerable
- Any other offence where there is visible physical material to be recovered e.g.:
 - Glass is broken
 - A window has been opened by an offender
 - A door has been forced/removed
 - Items have clearly been handled/moved
 - Footwear marks are present and visible
 - Body fluids are evident
 - Hair samples are present
 - Part eaten food/cigarette butts or drink cans are evident
 - Any other alien material has been brought to the scene by the offender

It is desirable that the officer first attending and the CSI should speak to one another by telephone if circumstances allow.

Items of property involved in crime

When anything that may have been used in crime, or abandoned by offenders, is handed to a patrolling officer or into a police station (knives, guns or blood stained pieces of wood or metal, for example), they must be dealt with in accordance with local instructions. The recovery of DNA samples and other forensic material should always be considered.

2.5 Contamination

The risk of post-incident contamination begins with the first person to discover the crime. They may have had legitimate pre-incident access or contact with the scene or any victim, and they may, therefore, have contributed to any background DNA that is subsequently found when samples from the scene are analysed.

2.6 Record of visitors to a crime scene

Because of the ease with which DNA contamination can occur, the first police officer should meticulously record the identity and actions of those who have already been to the scene and anyone else who may pose a post-incident contamination risk. It may become necessary to obtain elimination samples from them afterwards or make reference to their profiles on the PED.

SECTION THREE

Crime scene (CS) samples

3.0 CRIME SCENE (CS) SAMPLES

This section sets out good practice for the recovery of DNA from crime scenes. It does not deal with the recovery of other physical evidence for scientific examination.

The topics covered include:

- Responsibilities of crime scene investigators
- Assessment of the crime scene
- CS samples taken from individuals
- CS samples suitable for DNA analysis
- Success rates from various DNA samples
- DNA sampling variations between forces
- Recovering CS samples for DNA analysis
- Packaging and transporting CS samples
- Health and safety
- Submission of CS samples to laboratories for DNA analysis
- Samples taken in exceptional cases.

3.1 Responsibilities of crime scene investigators

In general, DNA rich crime scenes should be attended by a CSI as soon as possible; delay can reduce the probability of recovering suitable DNA material. However, decisions on which crime scenes CSIs attend will be governed by local policy. The policy should make a clear distinction between priority cases, where there is a well authenticated suspect who is in custody or being pursued and cases where there is no suspect.

Over-reliance on electronic reporting systems rather than personal contact may hinder effective communication with CSIs and increase the time between offence and examination. Therefore, decisions on sequencing of work should be based on the likelihood of DNA material deteriorating or being lost, contaminated or destroyed if delays occur and the effect this may have on the victim.

If an unavoidable delay occurs, victims should be contacted. They should be informed of the reason for the delay, the anticipated time of arrival, and the extent to which they can clear up the scene.

Directions for crime scene examinations made in connection with major crime investigations are contained in the ACPO Murder Investigation Manual.

3.2 Assessment of the crime scene

The CSI should be in possession of good information about the nature of the offence, the availability of witnesses and information about possible sources of contamination from background DNA.

In assessing a crime scene, a CSI should consider whether there is any relevant and recoverable DNA material present. If there is, its recovery should usually take precedence over the recovery of other samples because of the risk of contaminating DNA material by accident. An exception may occur when fingerprints have been left in blood.

3.3 CS samples taken from individuals

Victims who have had physical contact with an offender may have picked up the offender's DNA (for example blood or skin under their fingernails). A victim of this nature is treated as a "crime scene". Further information on recovering and packaging of these samples can be found in Appendix two, para 1.5. Guidance on taking intimate and non-intimate samples can be found in Section 4.7 & 4.8.

3.4 CS samples suitable for DNA analysis

Many types of evidential material found at crime scenes are suitable for DNA analysis.

This sub-section examines common sample types and discusses the quantity of sample normally required for DNA profiling and the likelihood of success.

Blood

Blood may be found in the form of pools, drops, splashes and smears. It may be flaked, liquid or dried. Blood can be recovered by swabbing or by scraping.

A heavy bloodstain, about the size of a matchstick head, is ample for standard STR analysis, although the same amount of blood thinly smeared over a large area may not give a result, as it is difficult to obtain a "concentrated" sample. If in doubt about the quantity, consult the force forensic submissions unit.

Consideration should be given, where there is sufficient apparent blood staining, to conducting a presumptive test for blood before taking a sample for laboratory analysis, as some substances (e.g. coffee or tea) can have a similar appearance to blood.

Semen

Semen may be found as a liquid (e.g. in a condom) or as visible staining. It may also be present but not visible and its possible location may have to be assumed when deciding what items to submit to the laboratory.

Liquid semen and even very small semen stains usually contain many sperm, each of which contains DNA. Even where the semen contains no sperm there may still be sufficient cellular material for DNA analysis.

Saliva

Saliva staining may, or may not, be visible. There is no DNA in saliva itself, but DNA is present in the mouth cells that are shed into the saliva.

Where a liquid sample of saliva is present or a saliva stain is visible, the quantity will usually be sufficient for analysis. However, the chance of obtaining a DNA profile is variable, as it is impossible to predict the quantity of mouth cells in any saliva sample. A discarded cigarette, partially smoked, may have few mouth cells present. In contrast, a well-chewed cigar butt may have ample.

The same applies to all the other potential sources of saliva, e.g. gags and balaclavas. Results from other sources such as drinking vessels and food are dependent upon the type and condition of the surface bearing the saliva, and currently the success rate for these types of samples is low.

Hairs

DNA is contained in the hair root and any scalp cells surrounding the root of a plucked hair.

Hairs may be found:

- Trapped in the shoes of someone who has kicked a victim

- Caught between surfaces at a point of entry
- Pulled out by a victim in a struggle with the offender
- On a weapon
- On a vehicle in a road traffic accident or collision
- Inside a balaclava or other head wear worn by an offender.

Any hairs that appear to have been pulled from the scalp should be considered for laboratory examination. Hairs should be collected using tweezers and placed in a rigid container, or within a folded sheet of paper. The root end should not be touched. An obvious clump should be kept together, whereas separate hairs should be packaged individually.

A single plucked head hair may have sufficient cellular material attached for DNA analysis. In contrast, naturally shed hairs, as often found on clothing, do not normally have sufficient DNA material associated with them for analysis. It is difficult to assess the quality of a hair root without examining it under a microscope.

Hair shafts

There is no DNA in hair shafts suitable for standard STR profiling, although mitochondrial DNA analysis can be used on pieces of rootless hair.

Flesh

Pieces of flesh may be encountered where an individual has been injured. This type of sample will contain large quantities of DNA and will be suitable for analysis.

At post mortem examination, deep thigh muscle may be a suitable sample when liquid blood, hair roots or buccal swabs are not available. The suitability of the sample will depend on the degree of decomposition of the muscle.

Parts of bodies

Parts of bodies are sometimes encountered at scenes, often in poor condition. However, there is still the potential of DNA analysis.

Vaginal fluid

Vaginal fluid will contain cells from the lining of the vagina and is suitable for DNA analysis.

Vaginal fluid may be encountered at crime scenes on items such as a condom or an implement. In such circumstances, the whole item should be recovered for submission to the laboratory.

Vaginal fluid may also be found mixed with semen as a result of drainage from the vagina after unprotected sexual intercourse with ejaculation.

Whether or not a DNA profile can be obtained from vaginal fluid is dependent on the quantity and condition of the sample(s).

Nasal secretions

Used handkerchiefs, where there are obvious nasal secretions, may be a good source of DNA.

Urine

Urine may contain cells from the lining of the urethra, although it is unlikely that there will be enough cells for DNA analysis. If the case is serious then advice should be sought.

Skin

It is a misconception that every fingernail cutting from anyone who has scratched someone will bear skin tissue that can be analysed. Fingernail cuttings are only likely to

be of any value for DNA when freshly taken from someone who has scratched deeply enough to get blood and possibly flesh under their nails.

Surface layers of skin are unlikely to be of value for standard DNA analysis and would require LCN methods of profiling.

Sweat

This is a liquid secretion and contains no DNA material. In cases where laboratories have been successful in obtaining DNA from sweat stained areas on clothing, this has been attributed to the coincidental presence of cells.

Fingerprints

It may be possible to obtain a profile by swabbing the residue left behind after retrieving a fingerprint and then examining it using the LCN DNA analysis technique.

Dandruff

Certain skin complaints result in excessive amounts of scalp and skin tissue that may be suitable for DNA analysis.

Faeces

Standard methods of DNA analysis are unsuitable for analysing faeces, unless mixed with blood, but mitochondrial DNA analysis can be used.

Bone

Relatively fresh bone marrow from post-mortem samples of badly decomposed bodies can be used for DNA analysis. Older bones are generally unsuitable for the standard DNA analysis, but mitochondrial DNA analysis can produce results.

See the Scenes of Crime Handbook (FSS, version 5, 2004) for further advice on recovering different sample types.

3.5 Success rates from various DNA samples

The success rates (FSS: April 2005), for various DNA sample types are:

Evidence types	Success rates
Semen	90%
Blood	87%
Chewing gum	78%
Cigarette butts	75%
Fingernail clippings	69%
Comb/Razor	53%
Hair with roots	50%
Saliva	40%
Hair without visible roots	15%
Cigarette lighter	10%
Watch strap	8%

3.6 DNA sampling variations between forces

At present (April 2005), there is a wide variation on the success rate of sample types recovered by different forces:

Blood	70 - 90%
Cigarette ends	54 - 85%
Cans/bottles	20 - 50%
All items	64 - 80%

The most common causes for these variations include swabs being submitted with no detectable blood present, cigarette ends submitted mouldy or in a poor condition and hairs having no root present.

3.7 Recovering CS samples for DNA analysis

The recovery of DNA samples from scenes of crime should only be undertaken by a fully trained CSI, if the resulting analysis is to be used in evidence.

The Scenes of Crime Handbook (FSS, version 5, 2004) gives further advice on recovering different sample types. The ACPO anti-contamination guidelines can be found at Appendix two of this manual.

Note: Individuals responsible for purchasing sampling equipment and materials should specify to suppliers that all equipment must be free from detectable levels of DNA.

When taking samples:

- Any object bearing DNA material should be photographed in situ, where practical
- Whenever possible, the item bearing DNA material should be recovered in its entirety
- If moistened swabs are required, only use sterile water. Tap water should not be used under any circumstances
- Use the minimum amount of water to recover sample effectively
- Avoid collecting extraneous matter that may limit or adversely effect the likelihood of obtaining a DNA profile
- Take control samples from an adjacent area that is uncontaminated by the sample material
- Always swab the control area before recovering the sample material, to avoid contamination
- Where it is not possible to take a control sample from an adjacent area, an unused swab should be submitted as a control
- DNA samples should be stored immediately in a cool box
- Make detailed contemporaneous notes on the relevant force scene attendance form
- Ensure information received from the aggrieved person, victim, or any witnesses is recorded on the appropriate force intelligence system. As much detail as possible should be provided, as this may assist officers interviewing a suspect.

Liquid samples

If blood, semen or saliva is present as a liquid or wet stain, it should be collected using dry swabs or pipettes (if available). Sterile cotton wool swabs are suitable for collecting CS samples. The sample should be collected on one area of the swab and not smeared over the whole surface.

Dried stains

Visible stains can be collected in a number of ways. The method of choice depends on the type of surface, the conditions and the equipment available.

- Swabbing - moisten a swab with sterile water and use the swab to rub the DNA material concentrating the sample on as small an area as possible
- Scraping – scrape the dried stain from the surface with a disposable sterile scalpel blade and place the flakes in a suitable sterile container or in clean folded paper
- Cutting – use a sharp sterile blade to cut out the surface (e.g. wood, wallpaper) bearing the DNA material.

3.8 Packing CS samples

Packaging should be sufficient to identify and protect the integrity of the exhibit and protect the handler from harm.

To achieve this:

- ✓ Pack, seal, label and reference all items or material as soon as they are taken
- ✓ Complete the scene examination attendance form and update it with the reference letters from the packaging
- ✓ Always use bags or containers of a suitable size or shape
- ✓ Secure solid items such as weapons, pieces of glass, drinking vessels etc. in rigid containers that do not allow friction to occur with consequent loss of evidence
- ✓ Seal all packaging securely using adhesive tape on all edges
- ✓ Freeze swabs as soon as possible.

Do not:

- ✗ Force items into packaging that is too small as bags may tear or lids may be forced off
- ✗ Use staples to seal packages
- ✗ Re-use packaging; if an item will not fit or packaging is used in error, the packaging must be discarded or ideally enclosed within the final packaging – it must not be used for a different item
- ✗ Pack control samples (e.g. glass and DNA reference samples) in the same outer container as items obtained from the suspect
- ✗ Allow samples to be kept in damp warm conditions
- ✗ Freeze items that may be subjected to fingerprinting
- ✗ Use string to secure items in rigid containers.

Damp items

Wet or damp items are susceptible to the growth of bacteria and mould that can destroy DNA. They may also pose health and safety risks.

Whenever possible, wet or damp items should be thoroughly dried before they are packaged. They can then be stored at room temperature without harm.

Items that are very wet may need to be removed from their packaging and placed on a sheet of paper to air dry. Direct heat should never be used. Arrangements also need to be made to ensure the security of the item whilst out of the packaging and to prevent its contamination, for example through sneezing or coughing, or by placing it in close proximity to other items where physical contact or transfer between the items can occur. The paper on which the item dried should be included as an exhibit.

Polythene bags should only be used for packaging an item that has been thoroughly dried. The only exception to this would be when a soaked item needs to be transported and anything other than a polythene bag would be impractical. In such circumstances, the item must be dried as soon as possible afterwards.

Leather items and footwear can never be thoroughly dried and must always be packaged in paper.

3.9 Transporting CS samples to police stations

CS samples should be transported, as soon as possible, to the police station. When appropriate, a cool box should be used. For further information on transporting CS samples, refer to Health and Safety Advice for Customers: Safe Submission of Items to the Forensic Science Service, 2004 (FSS).

The CSI should also:

- ✓ Complete the appropriate force documentation to provide evidence of continuity
- ✓ Place the samples that need to be frozen in the freezer immediately they arrive at the police station.

3.10 Health and safety

Laboratories have a duty under the Health & Safety at Work Act 1974 to protect employees and others who may be affected by its acts or omissions, against foreseeable risks to their health and safety.

Some of the items that are submitted could be of a hazardous nature. Laboratories need to be confident that such items are packaged in such a way that they do not pose a risk to the carriers, reception staff, scientists or analysts.

Note: Laboratories may return any item(s), if they present an unacceptable risk to the safety and welfare of staff or others who may be affected.

Hazardous materials could include the following:

- All liquid blood and body fluid samples, including toxicological samples
- Any item stained with blood or other body fluid
- Items infested with parasites
- Hazardous chemicals
- Explosives, explosive devices, incendiary materials and pyrotechnics
- Firearms and ammunition
- Any item with a sharp edge capable of causing injury.

The responsibility for the submission of hazardous materials in a safe condition lies with individual police forces and it is anticipated that suitable procedures have been or will be formulated. This advice will help to protect all personnel likely to be affected and will assist in compliance with health and safety regulations.

For further guidance, refer to the Scenes of Crime Handbook (FSS, Version 5, 2004) and Safety at Scenes of Crime Handbook, 2002 (FSS).

3.11 Submission of CS samples to laboratories for DNA analysis

Screening prior to submission to the laboratory

The DNA Liaison Officer or Forensic Submissions Officer should screen CS samples, taking into account the following:

- Force submissions policy
- Sample quality
- Success rates
- Evidential relevance
- Sample priority
- Whether there is an identified suspect available
- Whether the sample is required for any other laboratory examination.

DNA material should be submitted for examination as soon as possible due to the offending frequency of some individuals. Furthermore, submissions should not be delayed in order to await the outcome of any fingerprint bureau processes.

Submissions to the laboratory

Individual forces will have their own submission policies, but these will usually involve completing the appropriate laboratory submission form (MGFSP or equivalent) and obtaining appropriate financial authorisation.

3.12 Outcome of laboratory analysis of CS samples:

- **Full profile**
All the DNA areas analysed are present in the profile; all full profiles will be loaded to the NDNAD unless a match has already been obtained with a sample profile from the suspect.

- **Partial profile**
Not all of the DNA areas analysed are present in the profile. Partial profiles will be loaded to the NDNAD unless a match has already been obtained with a sample profile from the suspect or they fall below the minimum load criteria. Profiles that cannot be loaded to the NDNAD can still be speculatively searched against the NDNAD on a one-off basis at the request of the police. If sufficient sample remains, they can also be re-analysed at the request of the police using a more tailored analytical approach in an attempt to obtain a fuller profile.
- **No profile obtained**
This may be due to the DNA sample being insufficient in amount or unsuitable; the risk of this can be avoided if a more informed decision is made when deciding what items to submit for examination and proper care is taken to recover and preserve the sample.
- **Mixed Profile**
Analysis demonstrates the presence of DNA from more than one individual. If the profiles cannot be separated, they will not be loaded to the NDNAD. For further information, see Appendix one – Pendulum.

For further information on DNA match reports received from the NDNAD, see Section 6.0

3.13 Samples taken in exceptional cases

Cold case reviews

CS samples that were submitted for analysis before the current SGM+ profiling technique was developed may have failed to give a result. Such samples can be re-analysed. There is a possibility that more information could be obtained that might lead to the identification of the sample's source.

Missing persons

When there is real concern that harm may have come to a missing person and there may be a future criminal enquiry, DNA samples relating to the missing person could be analysed and included on the NDNAD for comparison with profiles from unsolved crimes. Suitable samples may be obtained such as hairs with roots from combs/brushes, cellular material on toothbrushes or body fluid stains from items definitely relating to the missing person. These samples are classed as CS samples.

'Irrelevant' CS samples

A CS sample may have been eliminated as not being from the victim or suspect and consequently considered to be irrelevant. It is possible, however, that the sample may have originated from a co-offender or another unidentified victim. Therefore, its inclusion into the NDNAD should be considered.

Deceased persons

The Serious Organised Crime and Police Act 2005 received Royal Assent on 7 April 2005. Section 117 of this act covered amendments to PACE, included in this was an amendment of s.64 to allow the NDNAD to be used to identify a deceased person or body parts, in circumstances where the person has died of natural causes or as a result of a disaster.

A DNA sample taken from an unidentified person can now be searched against the NDNAD to try to identify that individual.

(The amendment in relation to searching of databases to identify deceased persons was effective as of 7 April 2005).

SECTION FOUR

DNA samples taken from an individual

4.0 DNA SAMPLES TAKEN FROM AN INDIVIDUAL

Section four sets out the responsibilities of police when obtaining DNA samples from an individual.

Topics covered:

- Samples taken before and after April 2005
- Types of samples
- Samples taken from an individual arrested for a recordable offence
- Samples taken from a volunteer, victim and for elimination purposes
- Checking the PNC records
- Police powers to take intimate and non-intimate samples.

4.1

Samples taken before implementation of the PACE and Volunteer kits

Before 1 April 2005, several different sample kits were used to take DNA samples from individuals, these were:

- DNA 1 Kit or CJ sample: This kit was used to take samples from individuals for information or “intelligence” purposes.
- DNA 2 Kit or CW sample: This kit was used to take samples from individuals who had been arrested for a recordable offence where an evidential statement was required.
- DNA 3 Kit: This kit was used to take samples for elimination purposes including intelligence led screens.
- DNA 5 Kit: This kit was used to take samples from police personnel for the Police Elimination Database.

Samples taken after implementation of the PACE and Volunteer kits

In order to simplify DNA sampling, all samples taken **after 1 April 2005** will be processed to evidential standards.

- Arrestee (PACE) DNA sampling kit: This is used for all individuals who have been arrested for a recordable offence.
- Volunteer DNA sampling kit: This kit is used for all volunteers, victims and intelligence led screens.

Police personnel providing a sample for the Police Elimination Database will continue to be sampled using a DNA 5 kit.

4.2 Types of samples

Police may obtain DNA samples from:

- Individuals who have been arrested for a recordable offence
- Individuals charged with or reported for a recordable offence
- Individuals who provide samples voluntarily to assist in the elimination of their DNA from scenes of crime material
- Victims of crime when there has been personal contact between the victim and the suspect
- Individuals during the course of an intelligence led screen

4.3 Samples taken from individuals who have been arrested (see Appendix three - process map)

An Arrestee sample should be taken, using a PACE DNA sampling kit, from anyone who is detained at a police station and has been arrested for a recordable offence and:

- Who is a new offender and therefore does not have a PNC record
- or
- For whom there is not a DNA Confirmed (DC) or DNA Profiled (DP) marker on the PNC
- and
- Has not had a sample of the same type taken from the same part of the body during the course of the investigation - or such a sample was taken but proved insufficient

It is important to confirm the identity of the subject before taking a DNA PACE sample. This should be done by taking a photograph and fingerprints, and where possible using the Live ID function of Livescan. After analysis, the DNA profile will be loaded on to the NDNAD and searched against existing records. These include profiles from undetected crime scenes and other offenders. An offender's profile is a permanent record retained on the NDNAD that will be constantly searched against new profiles from scenes of crime and new offenders. The profile will not be removed from the NDNAD after the death of the individual.

Note: PACE does not allow police to take two samples from the same individual during the same investigation unless the first sample is unsuitable or insufficient. However, samples may be taken from the same individual in respect of different offences. This may result in replicate profiles on the NDNAD under different AS Numbers.

See Section 5.3 for information on submitting samples from individuals.

4.4 Samples taken from volunteers (see Appendix four - process map)

Volunteer samples should be taken using a Volunteer DNA sampling kit. The individual concerned must give written consent to provide the sample. Individuals can also volunteer to have their DNA profile stored on the NDNAD but in order to do this separate written consent must be obtained. Officers must explain that once the individual's permission is given it cannot be withdrawn and therefore their DNA profile will remain on the NDNAD permanently to be searched against other profiles. The profile will not be removed from the NDNAD after the death of the individual.

Samples taken from volunteers include:

Samples from victims of crime

A DNA sample taken from a victim who has had any physical contact with a suspect should be taken using a Volunteer kit. The victim should be treated as a “crime scene” in accordance with Section 3.3 of this manual. In most cases, it is not appropriate to load a victim’s DNA profile to the NDNAD and therefore it is not necessary to request separate written consent.

Samples for elimination purposes

The sensitivity of DNA analysis is such that it will often be necessary to request a DNA sample for elimination purposes from an individual who has had legitimate access to a crime scene. These samples should be taken using a Volunteer sample kit.

Samples taken for elimination during major investigations

During the investigation of a major crime, the officer in charge may decide to carry out an intelligence-led screen and request DNA samples from a large number of individuals. These samples should be taken using a Volunteer DNA sampling kit.

These intelligence-led screen samples can only be taken on the directions of a senior investigating officer following the guidance in the ACPO Murder Investigation Manual and Intelligence Led Screens: A manual of guidance, NCOF, 2004.

Samples from sex offenders

There are some circumstances when an offender, e.g. a sex offender, has been convicted but their DNA has not been taken and loaded to the NDNAD. In these cases, officers should ask the individual to volunteer their DNA in order to have it loaded to the NDNAD.

Remember:

- Volunteers who consent to have their DNA loaded to the NDNAD may not have a PNC record. Therefore, it is the responsibility of the police force taking the sample to maintain the details of volunteers on a separate system. The volunteer’s details may be required should a match subsequently occur.
- When the volunteer sample relates to a specific criminal enquiry, the barcode number of the sample must be quoted on the MGFSP form. The NDNAD profile can then be compared to the profile in the casework submission.

4.5 Checking the PNC record before taking a DNA sample

Before an Arrestee or Volunteer sample is taken, the PNC should be checked to see whether or not the DNA profile for the individual is already on the NDNAD.

The first page of the record will show whether there is a "DC" (DNA confirmed) marker. The DNA page of the record will show various markers entered by the NDNAD to indicate the status of the records of DNA profiles held by them.

If the PNC record shows a "DC" or "DP" marker, a sample should **not** be taken because the profile of the individual in custody is already on the NDNAD. In every other case, a sample should be taken.

In cases of serious crime, the SIO may consider taking a sample, even if there is a DC or DP marker.

The DNA page may show one of the following markers. These indicate the status of any previous samples taken from the individual.

- **DC** DNA confirmed - on the database and a conviction has been achieved
- **DP** DNA profiled - on the database
- **DR** DNA required - sample to be taken if the individual is in custody
- **DT** DNA taken - but not yet profiled
- **DF** DNA held in force - not submitted to a laboratory for analysis
- **DS** DNA rejected -
- **DM** DNA missing - sample not received
- **DD** DNA destroyed -

4.6 Updating the PNC

It is essential to update the PNC as to the status of each DNA sample. Some of the markers will be entered or changed by the force and others by the NDNAD.

4.7 Police powers to take a non-intimate sample

Non-intimate samples are swabs taken from any part of an individual's body including the mouth but not any other body orifice. A non-intimate sample can also be a sample of hair, other than pubic hair.

Non-intimate samples can be taken with or without the person's consent (see Section 4.9 for information on minors and consent).

In all cases, with or without consent, the individual must be informed that the profile may be the subject of a speculative search. The fact that the person has been informed of this possibility should be recorded as soon as is practicable after the sample has been taken.

The police powers for taking non-intimate samples are set out in PACE 1984, s.63 (1-3) and (8-9).

Non-intimate samples taken with consent

Most individuals will co-operate and consent to provide a non-intimate DNA sample when the law on the matter is explained to them i.e. if refused police may have no alternative but to take a non-intimate sample by force (co-operation in these circumstances will not amount in law to consent freely given). These non-intimate samples can be taken at any time by police officers or designated detention officers.

Non-intimate samples taken without consent

Under s.63 (2) PACE a non-intimate sample may be taken without co-operation or consent if certain conditions are satisfied.

An officer, using no more force than is necessary, can take a non-intimate sample from an individual who has not provided written consent if:

- The individual has been arrested for a recordable offence, or has been charged with such an offence or has been told that they will be reported for such an offence, or has been convicted of such an offence within the previous four weeks
- and
- The individual has not had a non-intimate sample of the same type and from the same part of the body taken in the course of the investigation
- or
- The individual has had a sample taken but it proved unsuitable or insufficient for analysis. This only applies if the first sample was taken after charge, see page 35.

In cases where it is necessary to use force to obtain the sample, it may be more appropriate to obtain a plucked hair sample rather than a mouth swab. See Section 5.2 - for information on taking and submitting hair samples.

Note: The Police Reform Act 2002 Chapter 30 (paragraphs 31 & 32) sets out the powers given to designated detention officers to taken non-intimate samples without consent.

4.8 Police powers to take intimate samples

Intimate samples include blood, semen, urine, pubic hair, any other tissue, fluid and swabs taken from an orifice of the individual's body other than the mouth.

An intimate sample may be taken only:

- When an individual is in police detention for a recordable offence
 - With the individual's written consent
- and
- When an officer of the rank of Inspector or above authorises the sample to be taken because they have reasonable grounds to believe that such a sample will tend to confirm or disprove the individual's involvement in the offence (s.62(1) PACE, 1984).

Remember:

- Except for samples of urine, intimate samples may only be taken by a registered medical practitioner or registered health care professional
- Dental impressions must be taken by a dentist
- A police officer should be in attendance to pack the samples and ensure continuity

- There is no power to obtain an intimate sample against the will of the donor, but the individual must be informed that they “do not have to provide this sample, but I must warn you that if you refuse, without good cause, your refusal may harm your case if it comes to trial”.

4.9 Consent including minors and psychiatric or sectioned patients

When dealing with children under the age of 14 years, a parent or guardian must provide consent. When the young person is 14 - 16 years old, an appropriate adult must witness their consent. In cases when the individual is a psychiatric or sectioned patient or any other individual who is or appears to be vulnerable, the consent of that individual should be sought together with the consent of an appropriate adult.

If consent is refused, providing the provisions of s.63, PACE, 1984 are satisfied, the sample can then be taken without their co-operation or consent using such force as is reasonably necessary.

4.10 Powers to take samples retrospectively

Samples can be taken retrospectively from individuals who have been convicted or found insane in relation to certain serious offences before 10 April 1995, who are still in prison or a mental hospital (s.63 (3C) PACE (Amendment) 1997) – providing that the officer has reasonable grounds:

- For suspecting the involvement of the individual in a recordable offence
- and
- For believing the sample will confirm or disprove the individual’s involvement.

The individual providing the sample should be informed of the reason before the sample is taken and the officer should record the reason as soon as is practicable after the sample has been taken.

For further information on police powers to re-take samples refer to Section 5.6

SECTION FIVE

Taking and submitting a sample from an individual

5.0 TAKING AND SUBMITTING A SAMPLE FROM AN INDIVIDUAL

Section five gives guidance on how to take and submit samples from individuals. It also provides information about sample retention and unsatisfactory samples.

Topics covered include:

- The procedure for taking buccal (mouth) swabs and hair samples
- Submission of samples to the laboratory
- Retention of Arrestee samples
- Unsatisfactory samples
- Re-taking failed samples

5.1 The procedure for taking buccal (mouth) swab DNA samples

The DNA sampling kits come complete with instructions, the relevant packaging and forms. All details on the DNA sampling kit form must be completed. Incomplete or incorrect forms will result in delays to the submission of the sample and may incur additional charges from the laboratory.

The extra bar code labels within the DNA sampling kits are labelled either for police use or laboratory purposes. All unused barcode labels must be placed inside the outer bag containing the samples. If omitted, the laboratory will have to generate extra labels for which the force will be charged.

Tips for taking buccal swab samples

- ✓ Wear disposable gloves throughout the procedure
- ✓ Ask the individual to moisten their mouth with saliva
- ✓ Take one of the mouth swabs provided and peel back the polythene cover to reveal the swab
- ✓ Hold the stem end and place the swab into the donor's mouth with the "comb" against the cheek
- ✓ Place the fingers of your other hand on the outside of the individual's cheek and scrape the swab firmly against the inside of the cheek about 5 or 6 times.
- ✓ Open one of the flip top sample containers. The swab should then be ejected into the sample container by pressing the stem end towards the swab. Once the sample is placed inside the container tube the top should be closed
- ✓ This whole procedure should then be repeated using the second swab on the inside of the donor's other cheek
- ✓ Ensure the bar code is on the DNA sampling kit form and complete the required details on the respective forms in block capitals using black ink
- ✓ The two samples should then be placed into the inner polythene bag provided and sealed in the presence of the donor
- ✓ The inner bag together with the spare bar codes and the DNA sampling kit form should then be placed in the outer polythene bag
- ✓ Place samples in a freezer and maintain an exhibit log using the barcode numbers
- ✓ Use the barcode stickers from the kit to minimise transcription errors.

If, during the sampling process, the swab is dropped or comes into contact with any other surface the procedure should be stopped and the DNA sampling kit must be destroyed. The samples should then be taken using a new DNA Sampling kit.

Note: Forces that automatically generate DNA sampling kit forms using the custody system should use the generated form to replace the DNA form that comes with the PACE DNA sampling kit.

5.2 The procedure for taking hair samples

On occasion, it may be necessary to take a DNA sample using hair (e.g. when an individual has injuries to their mouth or is drunk). A mouth swab kit can be used for this purpose. The mouth swabs should be discarded and the hair sample placed in the inner bag. All DNA mouth swab sampling kits include full instructions together with the relevant packaging and forms.

- ✓ Disposable gloves should be worn throughout the procedure
- ✓ No less than 12 hairs should be plucked
- ✓ Ask the suspect to indicate exactly from where on his or her body they wish the hairs to be taken (Note: pubic hair is an intimate sample and should not be used)
- ✓ Seal the packaging in the presence of the donor.

5.3 Submission of DNA samples from individuals to a laboratory

Samples should be placed in a freezer and an exhibit log should be maintained using the barcode numbers. Ideally, the additional barcode labels provided for police use should be used to avoid transcription errors.

Individual forces will have their own submission policies either via a PNC bureau or via a DNA central submissions unit.

Before submission of Arrestee samples, the PNC bureau or central submissions unit should ensure that a DT marker has been entered on the PNC record and that the Arrest/Summons (AS) number and barcode shown on the DNA sampling kit form matches exactly the AS number and barcode shown on the record.

The DNA sample should be kept frozen and transported to the laboratory as soon as possible. To avoid delay whilst maintaining continuity and integrity, the transportation system should be part of a dedicated force resource - not a system relying on CSIs.

Samples should be kept frozen in a coolbox during the journey; the handling of samples should be kept to a minimum. Evidential continuity will be required as per force procedures.

5.4 Submission of samples associated with casework

Sometimes a DNA sample may be taken for comparison with specified casework CS samples. In these circumstances, the exhibit number and crime reference number should be recorded on the DNA sampling kit form.

The officer should also complete an MGFSP form. This form should be used to record the exhibit number and crime reference number relating to the CS sample, the barcode number and AS Number relating to the Arrestee sample, or the barcode number and name of the Volunteer sample. This will help the laboratory to identify which profiles are to be compared.

The DNA profiles from all samples taken with a PACE DNA sampling kit will automatically be loaded to the NDNAD. There is no need for officers to request this separately.

5.5 Retention of Arrestee samples

It is not necessary to destroy the DNA profile if an individual is arrested and subsequently cleared of the offence, or a decision is made not to prosecute (s.64, PACE, 1984). Therefore, profiles of DNA samples taken from individuals who are not prosecuted, released without charge, against whom proceedings are discontinued or who are acquitted will remain on the NDNAD and will be the subject of continuing searches.

DNA samples are retained in cold storage at less than -15°C by the laboratory that analysed them. They are used mainly for upgrading the profile with the most current profiling system and for quality assurance purposes.

5.6 Re-taking unsuitable or insufficient samples

If a sample is rejected it may not be possible, or lawful, to take another sample from the individual. Therefore, it is important to follow procedures correctly and complete the documentation accurately. Officers must not take buccal swab samples or hair samples without first receiving appropriate training.

Officers should not take samples if they have a heavy cold, as coughing or sneezing during the process could contaminate the sample.

Samples can fail or be rejected for a number of reasons including:

- Anti-tampering seal on the inner bag broken or missing
- Poorly/incorrectly sealed bags
- Missing forms
- Incomplete forms
- Miss-matching of bar-codes on packaging and samples
- Unsealed tubes
- Samples missing
- Swab upside down.

Incomplete DNA sample kit forms can be rectified. However, this can cause delays and incur additional administration costs.

Re-taking failed samples

The Criminal Justice and Police Act (CJ&PA) 2001 extended police powers to allow the re-taking of DNA samples if the first sample proved insufficient or unsatisfactory. The detail of the Act defined that the re-taking of a non-intimate sample was permitted if the sample was lost, destroyed or contaminated, there was damage to the sample, or the DNA analysis of the first sample proved unreliable.

Time limits

The time limits for re-taking a sample are detailed in the PACE Codes of Practice. In most circumstances, the limit is one month.

	If Charged or Reported	If Convicted
If the sample was not taken	Period starts from the date the individual was charged or reported	Period starts from the date of conviction
If the sample was not suitable or insufficient	Period starts from the date the investigating officer was informed	Period starts from the date the investigating officer was informed

Under s.62 (1A) PACE, 1984, up to 3 samples in total may be taken before the power to re-take ceases. When the first two non-intimate samples have failed, the third sample should be an intimate sample (e.g. blood).

There is no provision at present for retaking a sample taken from a person prior to being charged or reported for summons, if it has been lost, destroyed, contaminated, damaged or the DNA analysis of the first sample proved unreliable. However, under the Criminal Justice Act 2003, a second sample of a different type and from a different part of the body may be taken without the consent of the individual. There is no power to compel an individual to attend at a police station for this purpose.

When the forensic supplier alerts a force to a sample failure, then it is extremely important to establish under what conditions the original sample was taken in order to determine if re-sampling powers exist.

SECTION SIX

Match reports from the NDNAD

6.0 MATCH REPORTS FROM THE NDNAD

Section six provides information about DNA matches received from the NDNAD.

The topics covered include:

- Types of DNA profile held on the NDNAD
- Match probability
- Chance matches
- Partial matches
- Types of matches reported by the NDNAD
- Negative searches
- Records that have been suspended or deleted from the NDNAD
- Cross force matches
- Aliases
- Matches from volunteers
- Removal of detected CS profiles from the NDNAD

6.1 Types of DNA profiles held on the NDNAD

The NDNAD contains profiles from individuals and crime scenes that have been analysed using either SGM or SGM+. All profiles from person samples will be full SGM or SGM+ profiles, but profiles from CS samples may be full or partial SGM or SGM+ profiles (see Section 6.4 below).

It is possible, therefore, when a match is identified, that the profiles may not have been analysed using the same technique and may not have the same number of points for comparison.

The types of profile involved in the match are indicated on the match report (e.g. SGM to SGM, SGM+ to SGM etc.). It will also state whether the profile was full or partial.

6.2 Match probability

The probability of two DNA profiles matching depends on the nature of the DNA profile and the circumstances of the case. A full SGM+ to SGM+ match is the most powerful. The strength of the match decreases if the profile is SGM or partial and there is an increased risk of the match being by chance.

Although a person's DNA is unique (except for identical twins, triplets etc.), some individuals who are closely related e.g. siblings may appear to have a similar profile. This occurs because they have inherited their DNA in different proportions from the same parents. The value of a match in a given case may therefore be weakened if there is a possibility that the offender could have been a close relative of the suspect.

Because the match probability depends on the fullness of the profile and the circumstances of the case, a match probability figure is not provided with a match report and the police and CPS should liaise with the scientist to assess the value of the evidence.

6.3 Chance matches

A match between two profiles on the NDNAD can occur simply by chance. This risk is very low when full SGM+ profiles are involved. However, the risk increases if partial or SGM profiles are involved and therefore, there is a significant chance that a match involving a partial profile or SGM profile may not match when the profile is upgraded to SGM+. Consequently, the laboratory should be asked to upgrade matches based on partial or SGM profiles. This is normally arranged via the force DNA Submissions Unit when the match report is received.

6.4 Partial matches

Partial matches may occur when a CS sample is deficient in either quantity or quality so that it is only possible to obtain part of the profile to compare with the complete profile obtained from a suspect. This will limit the comparison that can be made between the CS and person profile and it is advisable for the force DNA Submissions Unit to contact the laboratory that analysed the CS sample for advice on the value of the match.

The Custodian imposes a restriction on placing partial profiles on the database, although partial profiles may still be the subject of a one-off speculative search.

6.5 Types of matches reported by the NDNAD

There are three types of matches:

- Suspect sample matched to crime scene sample
- Crime scene sample matched to crime scene sample
- Suspect sample matched to suspect sample.

The first two types of matches are reported on match reports as soon as the match is obtained. The match reports are usually accompanied by one or more caveats warning of limitations in the value of the match. It is important to take account of these caveats when deciding how best to proceed.

6.6 Negative searches

The NDNAD only notifies forces of positive matches. They do not notify forces when a check has been made but no match has been found.

The NDNAD is updated at least daily (on working days) with CS profiles and person profiles. Therefore, a profile that does not produce a match today could do so in the future.

When an officer has a specific concern as to whether or not a profile has been checked and is negative or is still awaiting inclusion on the database, the force DNA Submissions Unit should be approached. They will check their records and, if necessary, contact the NDNAD enquiry centre for an update.

If a profile has failed to load to the NDNAD, the Custodian will inform the laboratory and the force so that corrective action can be taken.

6.7 Records that have been suspended or deleted from the NDNAD

A negative search may also occur when a profile has been suspended or deleted from the NDNAD. A profile record may be suspended at the request of a laboratory or the police if there is a question about its validity, pending investigation. Whilst suspended, the profile is not searched against the rest of the NDNAD. Following completion of the investigation into the validity of the profile, the record may be reinstated, amended or deleted. If the profile is amended or deleted, there may be implications for any matches reported before the suspension occurred. The Custodian will inform forces when records are suspended and when they are amended or deleted. The Custodian will also inform forces about any previously reported matches.

The investigation of records of uncertain validity may be a joint operation between the police and the laboratory. It is important that such investigations are completed promptly.

6.8 Cross force matches

Each force involved in a match will receive notification. The onus is on the force where the crime was committed to pursue the investigation.

When several scenes have been linked to an individual and the scenes are in more than one force area, usually the force with the most serious crime will lead the enquiry. In such circumstances, communication between investigating officers is crucial.

The force submitting the person sample should carry out the relevant checks on the individual, and inform the force in whose area the crime was committed of the results.

6.9 Aliases

Person to person matches may occur when an individual provides samples using different names. Police should validate the identity of the individual by fingerprint comparison between the two records. Once the identity is certain and the profiles have been fully matched, the NDNAD should be advised and force intelligence informed of the outcome of the enquiry. In order to remove duplicate profiles from the NDNAD, the force must liaise with their PNC liaison officer.

6.10 Matches from volunteers

There may be occasions when a match is reported from an individual who volunteered their DNA to be added to the NDNAD. In these cases, the individual may not have a PNC record but the force that took the Volunteer sample should have recorded the individual's details on a separate system at the time of sampling.

6.11 Removal of detected CS samples from the NDNAD

When a full SGM+ to SGM+ match is reported between a CS profile and an offender profile, the CS sample should be removed from the NDNAD, to avoid the risk of the same individual being re-arrested. It is the responsibility of the force DNA Submissions Unit to notify the NDNAD.

Note: There are plans for the removal of CS profiles (full SGM+ match) to be carried out automatically when the match is reported.

SECTION SEVEN

Investigation of match reports from the NDNAD

7.0 INVESTIGATION OF MATCH REPORTS FROM THE NDNAD

Section seven provides guidance about investigating match reports from the NDNAD, the evidential quality of profiles and charging individuals based on a match report.

The topics covered include:

- Investigation of DNA match reports
- Charging an individual based on a NDNAD match report
- Evidential quality of DNA matches
- Improved evidential standards
- Developing forensic evidence for presentation in court

7.1 Investigation of DNA match reports

If the DNA match is made between a crime scene and a person who has already been arrested in connection with the crime, the report should be forwarded to the officer in the case to pursue enquiries. The officer's attention should be drawn to any weakness in the DNA match.

After a match has been received by the Force DNA Submission Unit (or equivalent), the following checks must be made before the report is allocated for investigation. Forces may have different protocols for dealing with these checks but they should include the following points:

- Ensure the individual has been arrested, charged, reported or cautioned for committing a recordable offence and check that the sample was obtained lawfully.
- Fingerprints, for which identification is outstanding, should be checked against those of the individual named on the DNA match report.
- Similarities with other crimes should be investigated in order to identify a series of offences, e.g. any footwear marks should be checked against footwear marks from other crime scenes.

All this information together with fingerprints and other scientific evidence should be allocated as an intelligence package to the investigating officer and the progress of the inquiry should be monitored to its conclusion.

On receipt of the intelligence package, the investigating officer will need to consider whether the DNA match will form a significant part of the evidence that links the suspect to the crime. Careful consideration will also need to be given consideration to the evidential quality of the DNA match.

The result of these early considerations will, when balanced with other available evidence in the case (including any account given by the suspect), inform decisions on whether and when an Arrestee sample should be taken (see appendix five, page 60).

7.2 Charging an individual based on a NDNAD match report

On receiving the intelligence package the investigating officer should consider what further enquiries are to be made before the suspect is arrested and/or interviewed. The officer should bear in mind that a DNA match between a crime scene and an individual can only show that there is a high probability that there has been a physical connection

between the two and that there **must** be additional non-DNA evidence to support a charge.

Once the available evidence has been gathered, the suspect should be arrested and interviewed. Using DNA evidence raises some special aspects for the interview, which are described in Section 8. One aspect is the risk that the disclosure that the suspect has a DNA profile on the NDNAD will indicate, if used in evidence, that they have had previous convictions. In fact, there are an increasing number of profiles from volunteers and people who have been arrested but not proceeded against stored on the database and so the implication has become quite weak.

If, after the interview the investigating officer is completely satisfied that the suspect is the author of the crime, he should discuss the evidence with the duty prosecutor with a view to entering the charge(s) at once. There will seldom be any reason to ask for the forensic evidence to be taken forward at this stage; further work can wait until the prosecutor has received information from the defence about any parts of the evidence that are to be challenged. The discussions about supporting evidence and the charging decision should be recorded on the MG3 form.

7.3 Evidential quality of DNA matches

The amount of supporting evidence required will depend on the value of the DNA evidence in the context of the case. When appropriate, a scientist should be consulted to clarify the value of the DNA evidence. This will be the case when partial profiles are involved or for example, when the defence suggests that a sibling or close blood relative of the suspect is the real offender. This would require the match statistics to be re-calculated.

There is a significant chance that matches involving partial or SGM profiles will not match if the profiles are upgraded to SGM+. Therefore, when a match relying on a partial or SGM profile is the basis of a charge or is to be put in evidence:

- Consider whether it is necessary to upgrade the sample to SGM+ before a charging decision is made or before the case comes to trial. This will depend on the strength of other evidence in the case. For a full explanation, see appendix six, page 61.
- If there is a decision to charge an individual based on such a match, the supporting evidence needs to be stronger.

7.4 Improved evidential standards

There has been a change in practice. Before April 2005, samples taken from individuals (CJ samples) using a DNA1 kit were not processed to evidential standards. If evidence was required for presentation in court, a second sample had to be taken from the suspect. (Only in exceptional circumstances, with the prior approval of the Chair of the NDNAD Board have the DNA profiles from CJ samples been used in evidence.)

Following the introduction of the PACE DNA sampling kit (1 April 2005), profiles from all person samples will be of evidential standards and, in appropriate circumstances, may be presented as evidence without the need for a second sample to be analysed. Samples taken with the PACE DNA sampling kit can be recognised by their barcode number (96***** and above).

Some forces have always had a full continuity audit trail for CJ samples taken with the DNA1 kit, but there may still be concerns relating to the continuity of these samples in the laboratory or concerns over the identity of the suspect in cases when fingerprints were not taken to confirm the identity of the person. When evidence is required for matches

involving CJ samples taken before the introduction of the PACE DNA sampling kit, a second sample should continue to be taken.

Note: CS samples have always been processed to evidential standards and consequently the DNA profiles obtained can be used in evidence or added to the NDNAD. Likewise, if the profile came from a sample taken using a DNA2 kit it may also be used for the basis of an evidential statement.

Further information about charging and evidential standards can be found in the Guidance on charging and evidential standards from DNA matches (ACPO 2004) and Home Office Circular Number 58/2004: Charges on Basis of Speculative Search Match on the National DNA Database.

7.5 Developing forensic evidence for presentation in court.

In August 2004, the CPS implemented a new policy for prosecuting teams (police, duty lawyer and forensic scientist) to help cases progress quickly and effectively by only using forensic evidence when there is a dispute between the prosecution and the defence over the evidence.

The main effect of the policy for police will be to delay the development of the forensic evidence until the prosecutor has put the Advanced Information (AI) and letter to the defence and discovered whether:

- (a) The evidence of the Forensic Evidence Record (FER) for any of the scientific evidence is to be challenged

and

- (b) The DNA identification or other forensic evidence itself is to be challenged.

The response to this approach will show what further action is needed. In many cases it may save considerable time and expense. For example in a rape case where the issue is consent, the prosecution team will not necessarily need a full forensic report at the point of charge because the forensic evidence is not going to be in dispute.

The policy is designed to make effective use of resources by encouraging admissions as early as possible in order to focus on the actual issues in the case. Work is then targeted at the issues in the case, rather than producing extensive evidential material covering non-contentious points.

SECTION EIGHT

Disclosure of a NDNAD match
report when interviewing a suspect

8.0 DISCLOSURE OF A NDNAD MATCH REPORT WHEN INTERVIEWING A SUSPECT

Section eight includes information about preparing interviews, interviewing suspects and disclosure of information about a match report before the interview. Forces should consider using the West Yorkshire Police model - Operation Converter. The Police Standards Unit has circulated this as an example of good practice.

The topics covered include:

- Planning the interview
- Premature disclosure
- Non-disclosure
- The interview.

8.1 Planning the interview

Usually, the interviewer will prefer to hear what the suspect has to say about the allegation before giving detailed disclosure of the evidence. They will often outline to the suspect the offence alleged and the grounds for their arrest, ask the suspect to account for their movements at the time of the offence, and then disclose later in the interview any incriminating evidence, including DNA identification.

A legal representative acting for a suspect has a duty to ensure their client is properly advised before the interview commences. In order to fulfil this duty, the legal representative must be provided with some details concerning the offence alleged and the grounds upon which their client was arrested. If the police, before the interview, do not give the legal representative this information, they are likely to advise their client not to answer questions. A court may draw inferences from a defendant's failure or refusal to answer questions during interview, but not if it believes the failure or refusal was reasonable.

It is therefore in the interest of all parties concerned for some information to be disclosed to the suspect and their solicitor before or at the beginning of the interview.

Each situation is different and should be judged on its merits when preparing for each interview, taking into account the benefits to the investigation. Officers should keep control of the interview process by asking themselves the following questions:

- What to disclose?
- Why are they disclosing the information?
- What are they not disclosing?
- Why are they not disclosing information?
- How to handle non-disclosure?

This decision-making process shows not only the need for planning for the actual interview itself but also preparing for the consultation with the legal representative. Officers should make their decisions in the full knowledge of possible consequences e.g. the intervention by a legal representative when 'new' evidence is introduced or questions raised by the court as to the reasons behind the officer's decision.

Officers should record:

- ✓ The details of the information disclosed
- ✓ The stage at which this information was disclosed
- ✓ The reasons why certain information was not disclosed
- ✓ Any questions and comments made by the legal representative together with the officer's responses.

The officer should then at the outset of the interview repeat for the tape record exactly what has been disclosed to the suspect and their legal representative, so that there can be no dispute over it at a later stage. For this purpose, the officer should write down the information that is to be disclosed when planning the interview. The note can be referred to when repeating the disclosure on tape and retained in case it is required in court.

8.2 Premature disclosure

Premature reference to DNA profiles before or during an interview may provide the suspect with an opportunity to fabricate an explanation to support a claim of lawful access or to give a false account to explain the reasons why the evidence exists.

8.3 Non-disclosure

The suspect should be given an opportunity to establish their position as to lawful access/explanation without the disclosure of the DNA. However, there is little point in conducting an interview with a suspect if they do not know why they are being interviewed. Not only would this be unfair on the suspect, but also the interviewer would be unlikely to achieve the aim of the interview.

Innocent suspects have nothing to fear from non-disclosure of all of the police evidence, provided they are fully aware of what is alleged against them. Indeed there will be occasions when it is to the advantage of the innocent person to be allowed to provide a full and uncontaminated account without knowledge of some of the evidence. Their innocence may become clear to the investigators at an earlier stage of the investigation. Equally, guilty suspects may wish to give a full, honest and uncontaminated account of what occurred, but they should not be given the opportunity to fabricate a defence or an alibi around the police evidence.

When pressed by the legal representative for further disclosure before an initial interview, the officer could well say, "we have given what we consider to be the fullest appropriate information at this stage, and we wish to give your client the opportunity of giving their account of this incident".

Remember:

- Officers are under NO legal obligation to disclose information before a suspect interview and officers have the right to decide how much information is disclosed at this stage.
- If a charge is brought, the CPS decides what documents are disclosed to the defence.
- The effect of unplanned pre-interview disclosure may have an adverse affect upon the subsequent interview(s) and investigation.

8.4 The interview

The opening stage of the interview is likely to result in one of the following situations:

- a. An admission that is sufficient to charge the suspect (see section 7.2 – 7.4).
- b. An explanation that satisfies the officer that no criminal suspicion can be attached to the finding of the CS sample e.g. the suspect had lawful access at the material time or a legitimate reason for touching the object on which the evidence was found. Then, in the absence of other evidence, the suspect will be released without charge.
- c. If “a” and “b” do not apply e.g. the suspect denies being present/touching objects at the material time, at the appropriate stage of the interview the evidence should be disclosed and put to the suspect. This may result in the suspect making an admission which would then lead to the process as described in “a”.

The officer will need to balance the account provided by the suspect against the evidence available and vigorously test the explanation if there is any doubt.

If the suspect continues to deny the offence and continues to do so during subsequent court proceedings, then the questions during the interview may be deleted subsequently from the interview summary, thus negating any concern about implying previous convictions. In this situation, an evidential statement is likely to be required.

If the legal representative asks at any time before or during the interview “do you have DNA evidence?”, before it is appropriate to disclose that information, the interviewer must not lie or deliberately mislead (R V. Mason 1988).

A well-prepared interviewer should therefore be confident in saying “I have given you what I consider to be appropriate information. I now intend to interview your client and ask him or her to give his or her account of the incident”.

Remember:

Police must use the disclosure of DNA evidence in an ethical manner. Officers should not attempt to mislead legal advisers or suspects by implying that the suspect has left DNA at a scene or on recovered items when they have not. This would be unfair to the suspect and highly likely to be deemed unlawful. The court would rule evidence gained by such deception inadmissible.

The ACPO Practical Guide to Investigative Interviewing provides further guidance on pre-interview disclosure.

APPENDICES

APPENDIX ONE

OTHER DNA TECHNIQUES

Police dealing with cases involving DNA analysis need to be aware of the existence of some other analysis techniques (other than SGM+) that can be adopted in exceptional circumstances. The following section outlines some of the techniques currently available.

Analysis of Y-chromosomes

The Y-chromosome is present only in men and it can be analysed using two DNA profiling methods, Y-STR and Y-SNP.

Y-Chromosome Short Tandem Repeats (Y-STRs)

Analysis of the short tandem repeats (STRs) on the Y-chromosome can demonstrate relationships between male members in a family. This is because a man shares the same or similar Y-chromosome profile with his father, his grandfather and brothers.

As the Y chromosome is only inherited down the paternal line, the number of Y-STR markers are fewer than would be available using SGM+. Therefore, Y-STR profiles are less discriminating. They are also incompatible with the STR profiles loaded to the NDNAD.

Y-STRs can be particularly useful in the investigation of sexual assault cases. Since Y-chromosome sequences do not occur in females, male DNA can be identified from samples where there may be mixed male and female cells – even if there is only a very small amount of male DNA.

This can be extremely useful in sexual assault cases where:

- The amount of semen on vaginal swabs is low or absent.
- Saliva has been deposited through kissing and licking.
- Skin contact has taken place e.g. during strangulation or digital penetration.

Note: Analysis of Y-STRs can also be used in familial searches (see below).

Y-Chromosome Single Nucleotide Polymorphisms (Y-SNPs)

Y-SNPs are markers on the Y-chromosome that are inherited down the paternal line. The Y-SNPs change very little between generations and it is possible to use the analysis of Y-SNPs to infer an individual's possible ethnicity. This technique can be particularly useful in providing information about unidentified bodies.

Y-SNPs can be used in conjunction with other DNA profiling techniques, such as analysis using SGM+ and mitochondrial DNA, and the Red Hair Test.

Familial Searching

Familial searching is based on the premise that the DNA profiles of individuals who are related to each other are more likely to contain similarities than the DNA profiles of two unrelated individuals.

Familial searching of the NDNAD can provide DNA intelligence during investigations into serious crimes when a full DNA profile has been obtained from a CS sample, but this subsequently fails to produce a match when the NDNAD is searched.

Familial searches of the NDNAD can provide information about:

- The identity of an individual who could be a parent or child of the offender
- The identity of the offender's sibling.

Case file example:

Familial searching was used for the first time in 2002 in the case of three girls who were raped and murdered in South Wales in 1973. Even though a DNA profile was obtained, a search against the NDNAD and an intelligence-led screen failed to find a match. A search of the NDNAD was carried out for possible relatives of the offender. This search came up with 100 names. The investigating force, using this intelligence and information they already had, identified a local suspect. The suspect had died but his family volunteered to give DNA samples to help the investigation. The results of the DNA tests led to the exhumation of the suspect's body and subsequent DNA tests showed a match with DNA samples obtained from the bodies of the three dead girls.

Paternity

It is possible to use DNA profiling to determine the parentage of a child by comparing the DNA profile of the child with the DNA profiles of the mother and the alleged father.

Using paternity DNA profiling, it is possible in some cases to exclude a claim of fatherhood with absolute certainty. In the event that paternity cannot be conclusively excluded, a statistical assessment of the probability of paternity will be produced.

Autosomal Single Nucleotide Polymorphisms (A-SNPs)

This method of DNA analysis is designed to target very small lengths of DNA so that even degraded DNA that has broken into small fragments can be analysed.

This technique is useful for analysing degraded material such as old bones, decomposing remains or body fluids that may have been exposed to extremes of temperature and humidity. As a result, it can be helpful when identifying the remains of missing persons and victims of mass disasters.

A-SNPs analysis examines different areas of DNA to those analysed by SGM+ and the results are therefore incompatible with the profiles on the NDNAD. A-SNP analysis should only be used after attempts have been made to obtain a DNA profile using SGM+, LCN and mitochondrial DNA analysis techniques.

The use of A-SNPs should be considered where a partial profile has been obtained through SGM+ or LCN and where degradation of the DNA is suspected. The use of A-SNPs for the analysis of mixed stains is complex and very limited.

Pendulum

CS profiles can be mixed profiles and contain the DNA from more than one person. If the sample contains more DNA from one profile than the other, the two profiles can be separated and analysed. However, when the sample contains roughly equal amounts of DNA material from several unknown individuals, the mixture is impossible to separate.

A software programme (Pendulum) has now been developed that produces a list of profiles in a 2-component mixture that could combine to "best fit" the mixed profile in question. This list can include many thousands of profiles. The profiles on the list cannot be loaded to the NDNAD but may be compared against the NDNAD using a one-off speculative search.

Although there may be hundreds of potential profiles on the list, the discriminating nature of the search usually only produces one or two matches, allowing one or on occasion both individuals to be identified.

This technique can also help to identify and link a series of crime scenes.

APPENDIX TWO

ACPO DNA ANTI CONTAMINATION GUIDELINES

This guidance deals with the minimisation and detection of post-incident DNA contamination, directly by individuals in an investigation or from one item of evidence to another.

1.1 Introduction

Current DNA profiling methods are very sensitive. Using SGM+, it is routinely possible to detect very low levels, equivalent to approximately 50 complete cells and it is even possible to detect the DNA present in a single cell, although in practice several cells are commonly required. In some circumstances, DNA profiles can now be obtained from flakes of dandruff or watchstraps and rings, for example. The consequence of this improved sensitivity is that it is essential to take effective anti-contamination precautions when investigating all cases potentially involving DNA evidence to ensure that any DNA results obtained can be properly interpreted and are reliable.

The increased sensitivity of DNA analysis also means that background levels of DNA can be detected that did not come from the victim or offender. This represents extraneous DNA present legitimately on an item before an offence and the anti-contamination precautions recommended here will not reduce the level of such DNA on items.

However, the precautions will help to reduce the level of any DNA deposited after an offence by individuals visiting the scene and/or investigating the offence.

It is not possible to eliminate the risk of DNA contamination and there may sometimes be conflict between taking effective anti-contamination precautions and other police responsibilities. The risk of contamination will be the same in all types of investigation, whether into serious or volume crimes, but the consequences of a misleading result being produced in the investigation will clearly be different. There therefore needs to be a flexible approach to reducing the risk of DNA contamination that is proportionate to the potential impact of such contamination on the investigation.

1.2 Control of the scene

The possibility of post-incident contamination begins with the first person to discover the crime. They may have had legitimate pre-incident access or contact with the scene or any victim, and they may therefore have contributed to any background DNA subsequently detected when samples from the scene are analysed, but they also pose a post-incident contamination risk and details should be retained of their visit to the scene and what they did there.

The first officer attending should be trained in the risks of contamination and should handle potential evidential material as little as possible. Where this is unavoidable, a record should be kept of what has been handled.

Scene log

A scene log should be maintained of all subsequent visitors to the scene, who they are, what they did and any personal protective equipment worn e.g. gloves. The number of visitors to the scene should always be kept to the minimum consistent with a proper investigation being carried out. This is even more important when each visitor is a potential source of contamination. It should be a pre-requisite for any visitors to the scene that they may subsequently be required to provide a DNA elimination sample (in the form of a mouth swab) if the possibility of contamination becomes an issue.

1.3 Barrier Clothing

Most contamination takes place by handling items without gloves or by talking, coughing or sneezing over items. DNA techniques have become sensitive enough to detect the DNA found in the aerosols of saliva produced when talking etc. or in skin cells deposited

on handled items. It is therefore recommended that at all scenes of crime, regardless of the seriousness of the offence, examining officers wear disposable gloves and disposable surgical facemasks when handling exhibits.

Gloves

Disposable gloves should be put on before handling, swabbing or packaging any evidential material and care should be taken to avoid, for example, touching the face, wiping the forehead, blowing the nose and scratching the head whilst wearing the gloves. If this occurs, the gloves should be discarded and replaced with new ones.

Any cuts or grazes on the hands should be covered with waterproof dressings. The gloves should similarly be changed after touching any frequently handled items such as door handles, TV controls, light switches or windows at the scene, to avoid any inadvertent transfer of DNA material. This also applies to items brought to the scene that are habitually touched such as pens and mobile phones. In fact, consideration should be given to decontaminating these items before entering the scene or leaving these outside the scene.

It is also important that gloves are worn over the top of cuffs and changed between handling exhibits as cross-contamination can occur between the two items. Powdered gloves should be avoided as the powder contained in many types has been shown to inhibit subsequent DNA analyses and/or potentially contaminate the items. A list of recommended gloves compatible with DNA analysis can be obtained from the FSS.

Disposable surgical facemasks

Disposable surgical facemasks should be worn to cover the chin, mouth and nose. For individuals wearing spectacles, pinch-nose facemasks should be made available. Facemasks should be put on before any other protective clothing to avoid contaminating this clothing with saliva aerosols.

Extreme care should be taken if anyone attending the scene or examining a victim has a medical condition, such as eczema, a cold, a cough or influenza that results in the shedding of body fluids or particles. Wherever possible, such individuals should be denied access to a scene.

Serious crime

In more serious cases all personnel visiting the scene should be equipped with disposable suits with hoods and footwear protection as well as the disposable gloves and disposable surgical face masks. Disposable suits should be worn fully zipped up, with either the hood on or a mobcap being worn, ensuring that all hair is covered.

It should be a requirement for anyone carrying out a scene examination, or examining a victim or suspect, or examining clothing from a victim or suspect, to wear such personal protective clothing. This should be declared in force policies and all relevant personnel should be trained to understand the reasons behind this requirement.

1.4 Recovery and packaging of materials from scenes of crime

Where practical, all evidential materials should be photographed or recorded before being touched. Portable items for DNA analysis should be recovered as a whole for sampling in the laboratory as experience has shown that there is then an increased chance of obtaining a full DNA profile. Other items should be sampled at the scene. Whichever, handling should be kept to a minimum. The recommended sampling procedure, preservation and packaging are detailed in the FSS Scene of Crime Handbook (Version 5).

Sampling equipment

All sampling equipment should be sterile and free from detectable levels of DNA. Instruments that are purchased simply as sterile are not necessarily free from DNA. However, if instruments are marked STERILE with an 'R' alongside and carry a CE mark,

their entire manufacture must have been overseen by an independent EU Notified Body such as BSI. This will ensure that their entire manufacturing process, from the raw material stage to gamma-irradiation sterilisation of finished products, will have been carried out under controlled conditions. The likelihood that these instruments will bear detectable levels of DNA material is therefore significantly reduced.

Non-disposable equipment

Wherever possible, disposable equipment should be used. When disposable equipment is not available, each item of equipment should be decontaminated prior to use, between use in taking different samples and after use. Tweezers with ribbed ends should be avoided, as they are difficult to clean. Pens, rulers, mobile phones and the like must also be decontaminated.

Gamma-irradiation or thorough cleaning with chlorohexidine/ethanol, as found in Mediwipes or Microsol 3 based wipes will usually suffice to remove lightly contaminating DNA. Other alcohol-based wipes may not be effective.

Equipment that has become heavily contaminated should be submerged and soaked for at least 10 minutes in 10% Microsol 3, removed, rinsed with sterile distilled water, wrapped in foil and baked at 120°C for 24 hours. Flaming, or standard medical sterilisation procedures such as autoclaving, are not sufficient and will not always destroy all DNA residues.

Sampling swabs

All swabs used for sampling should be free from detectable levels of DNA before they are used, as swabs containing background DNA may give rise to misleading results. The sample swabs should be submitted to the laboratory together with an unused control swab from the same batch. Swabs that have been tested for the presence of DNA material and declared to be suitable for recovering DNA samples are available from the FSS. Control swabs from this source will not be processed automatically and will only be examined if it becomes necessary for the investigation of artificial peaks in a DNA profile.

When samples are taken with swabs that have not been tested and shown to be suitable for recovering DNA samples before use, the control swabs will be examined as a matter of routine. Dependent on the background level of DNA found on such control swabs, it may not be possible to interpret reliably any mixed profiles obtained from the sample swabs.

Sampling water

If required, a minimal amount of sterile distilled water may be used to moisten the swab and as much of the stain as possible, and can be concentrated in one area.

Distilled water tested for the presence of DNA material and declared suitable for recovering DNA samples should be used. If this is not possible, the laboratory must be notified that an unvalidated source of water has been used, and a sample of the water must be forwarded to the laboratory for analysis.

This is because water from an unvalidated source, or its container, may well contain levels of background DNA material that could potentially give misleading results, and the water will need to be checked for the presence of such DNA. Whenever water has been used to assist in recovery of the sample, it is important that the swab is frozen as soon as possible afterwards, as unfrozen moisture will speed up the degradation of DNA, thereby reducing the chances of obtaining a full DNA profile.

Handling evidential material

Only one item of evidential material should be handled at any one time in any one place once it has been recovered from the scene. All handling after collection should be carried out over disposable paper or on a surface that has been decontaminated for the purpose with 10% Microsol 3 solution and then wiped with Mediwipes. If disposable paper is used

it should be changed between each item of material handled; surfaces should be decontaminated and gloves changed.

Wherever possible, evidential materials should be air-dried before being packaged. Heat will cause degradation of any DNA material present, so heat-accelerated drying is not recommended. Forced air currents should also be avoided if this could lead to air-borne transfer of material between items from different individuals or between items from individuals and the scene. Drying rooms should be decontaminated before and after use with 10% Microsol 3 solution and consideration should be given to routine monitoring of such facilities for build up of DNA.

Evidential materials should be packaged, sealed and labelled as soon as possible. Adhesive tape should be used for sealing. It is also important to use packaging which is of an adequate size, leak proof, non-breakable and puncture resistant. The laboratory should be notified if any sample has leaked or has had to be repackaged.

All packaging materials should be stored in a way that minimises the risk of DNA contamination. Even new packaging should be discarded if there is a risk that it could have come into contact with a source of DNA. Packaging should never be re-used, no matter how costly.

Once sealed, packages should not be re-opened, even for interview purposes. If visibility is required, bags with transparent panels should be used.

Recovered materials should never be placed in the same outer packaging as control samples. Separate sacks should be used.

1.5 Recovery and packaging of materials from suspects and victims

Suspects and victims should be considered an extension of the scene for recovery and packaging purposes and treated accordingly as above. All containers used for transportation (e.g. cool boxes, crates, etc.) should be cleaned before and after every use.

Disposable (single use) scissors or clippers should be used to cut fingernails in preference to taking fingernail scrapings. In their absence, cocktail sticks or their equivalent could be used to take scrapings. Disposable scalpels and forceps should be used for any material being excised or removed for DNA analysis. Disposable forceps should be used for the pulling of body hair.

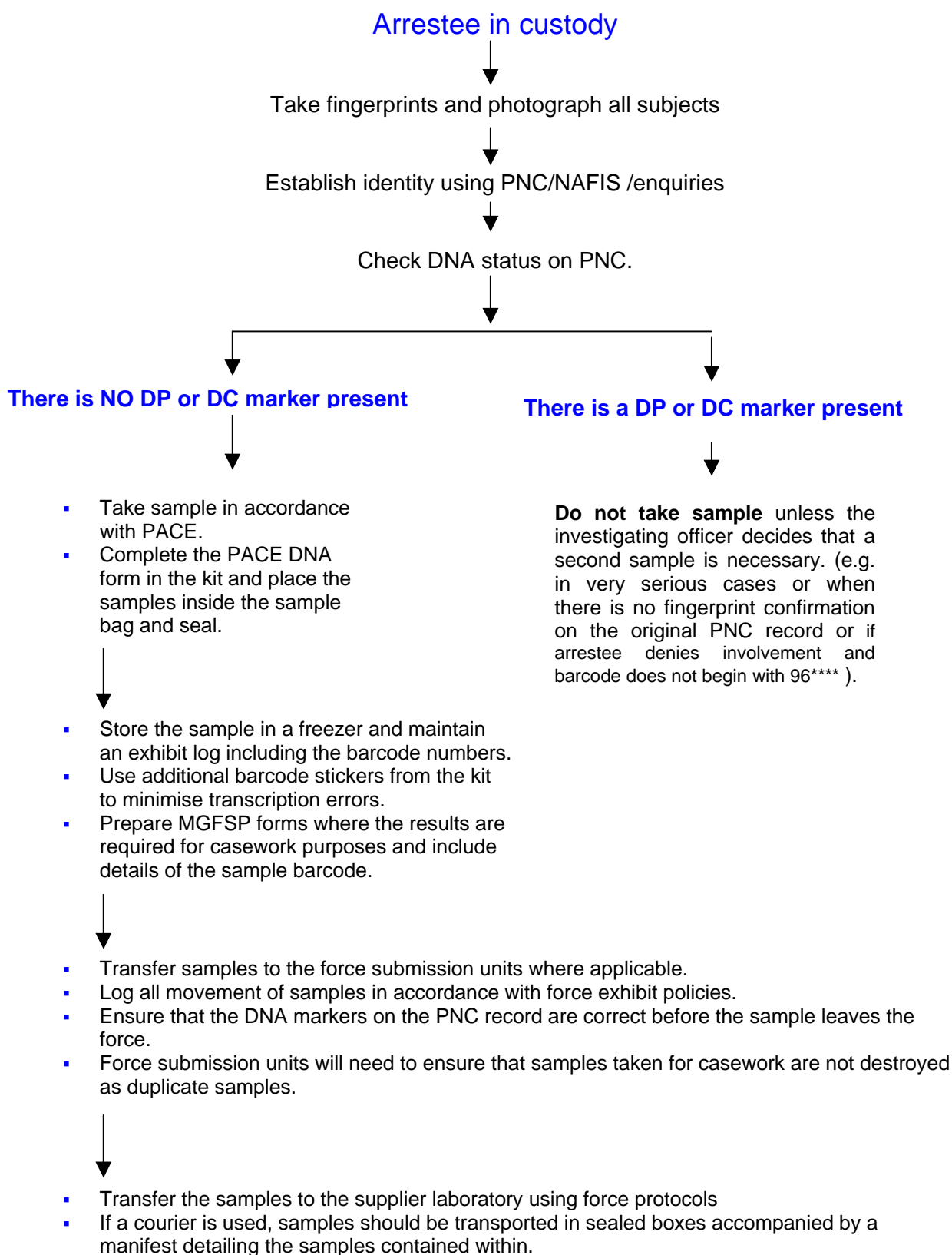
Different individuals at different locations should deal with suspects and victims. Items recovered from suspects and victims should be handled separately. Similar separation should be practised for multiple suspects.

Neither suspects nor victims, nor clothing or other items recovered from them, should be handled by any personnel who have been to the scene or involved in the packaging of materials from the scene, or at any location where materials from the scene have been handled, unless they have taken appropriate measures to avoid cross-contamination. These measures should include washing of the hands and face, or preferably showering, and a change of clothing. A time delay without these precautions will not suffice.

The laboratory should be informed if there has been any risk of contamination between suspect(s), victim(s) and the scene.

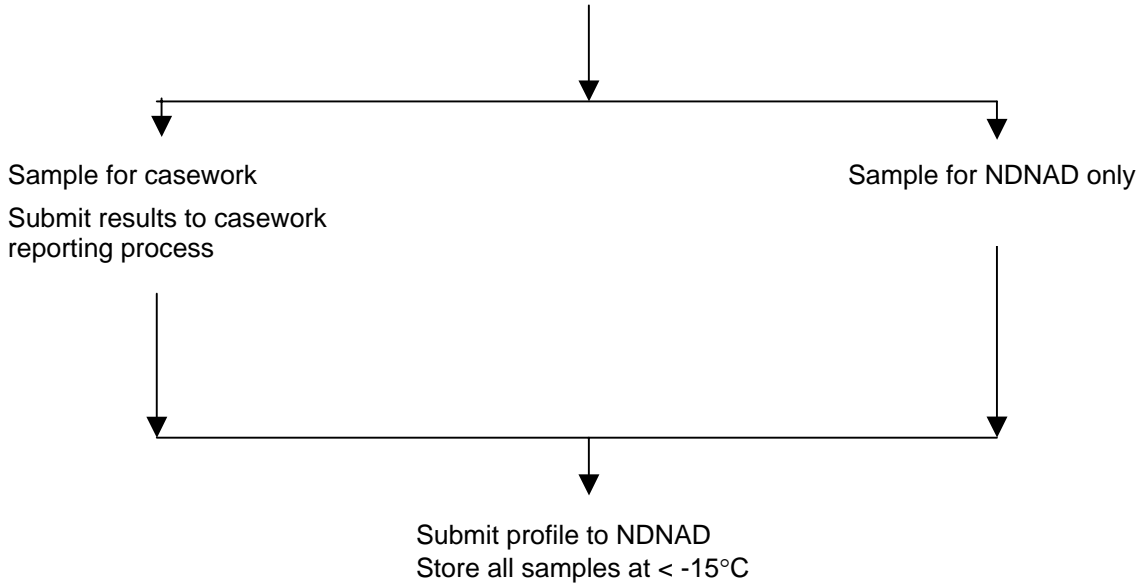
APPENDIX THREE PROCESS MAP: TAKING DNA SAMPLES FROM ARRESTEES

IN FORCE:



FORENSIC SUPPLIER

Receive and analyse sample
Record details of the sample submission and create a continuity record (FER) for each sample throughout its processing.



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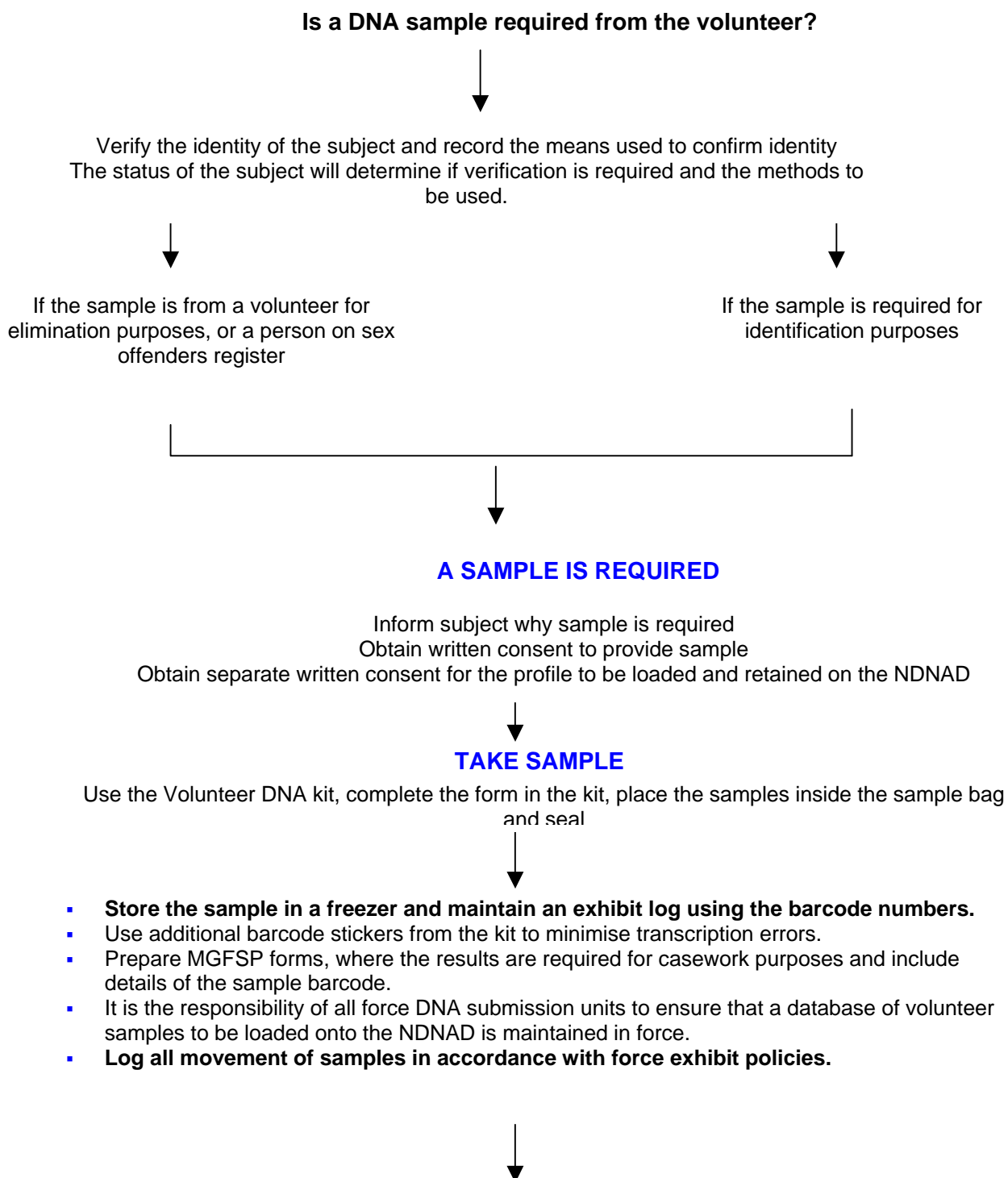
Load profiles to the NDNAD

Issue match reports to forces

APPENDIX FOUR PROCESS MAP: TAKING DNA SAMPLES FROM VOLUNTEERS

This kit should be used to obtain DNA samples from volunteers for elimination purposes (e.g. victims, persons included in intelligence led screens), persons on the sexual offences register. It is also used identify persons involved in criminal paternity cases, familial searches and for identification of victims of mass disasters

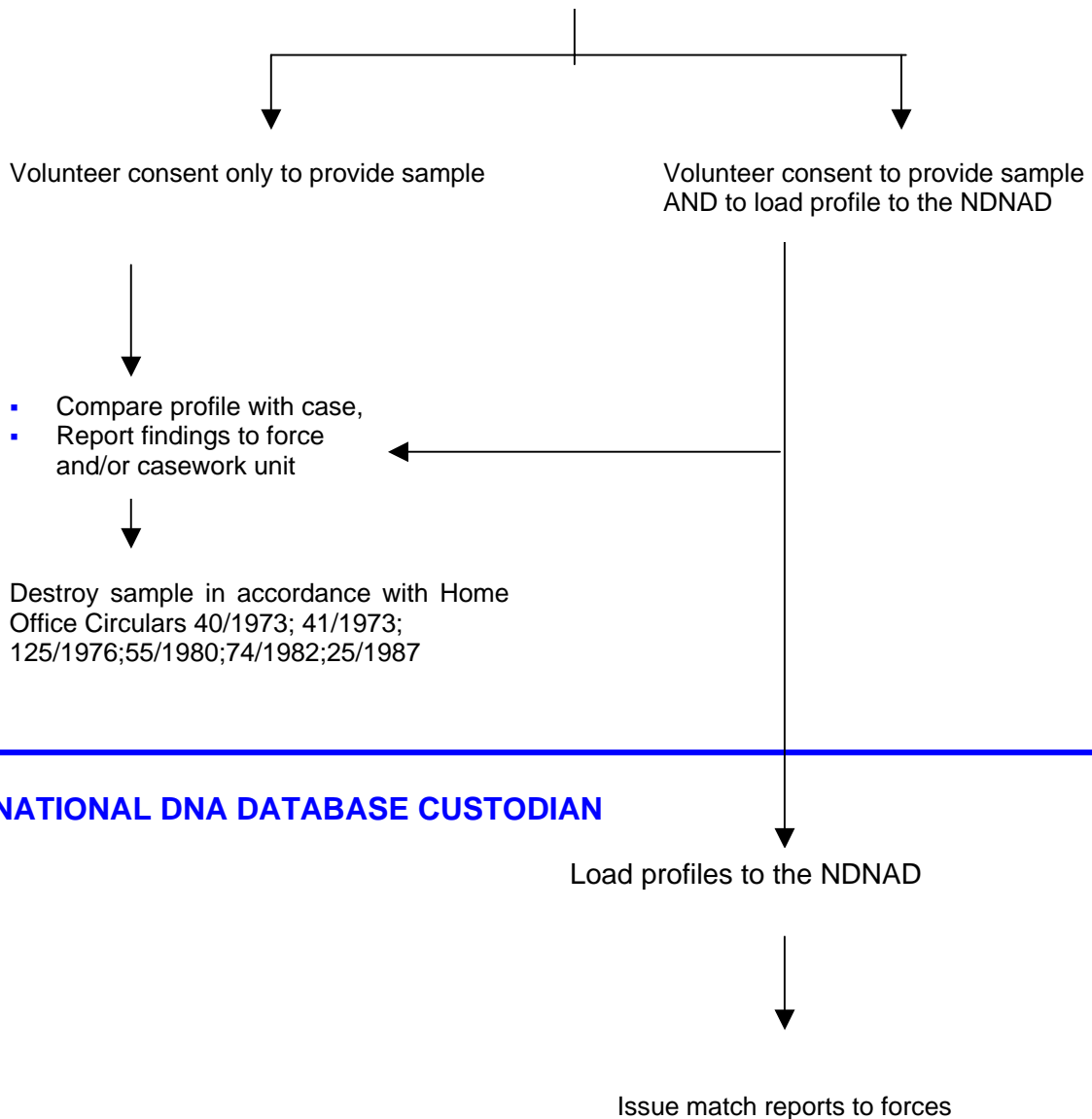
IN FORCE:



- **Transfer the samples to the supplier laboratory using force protocols**
- If a courier is used, samples should be transported in sealed boxes accompanied by a manifest detailing the samples contained within

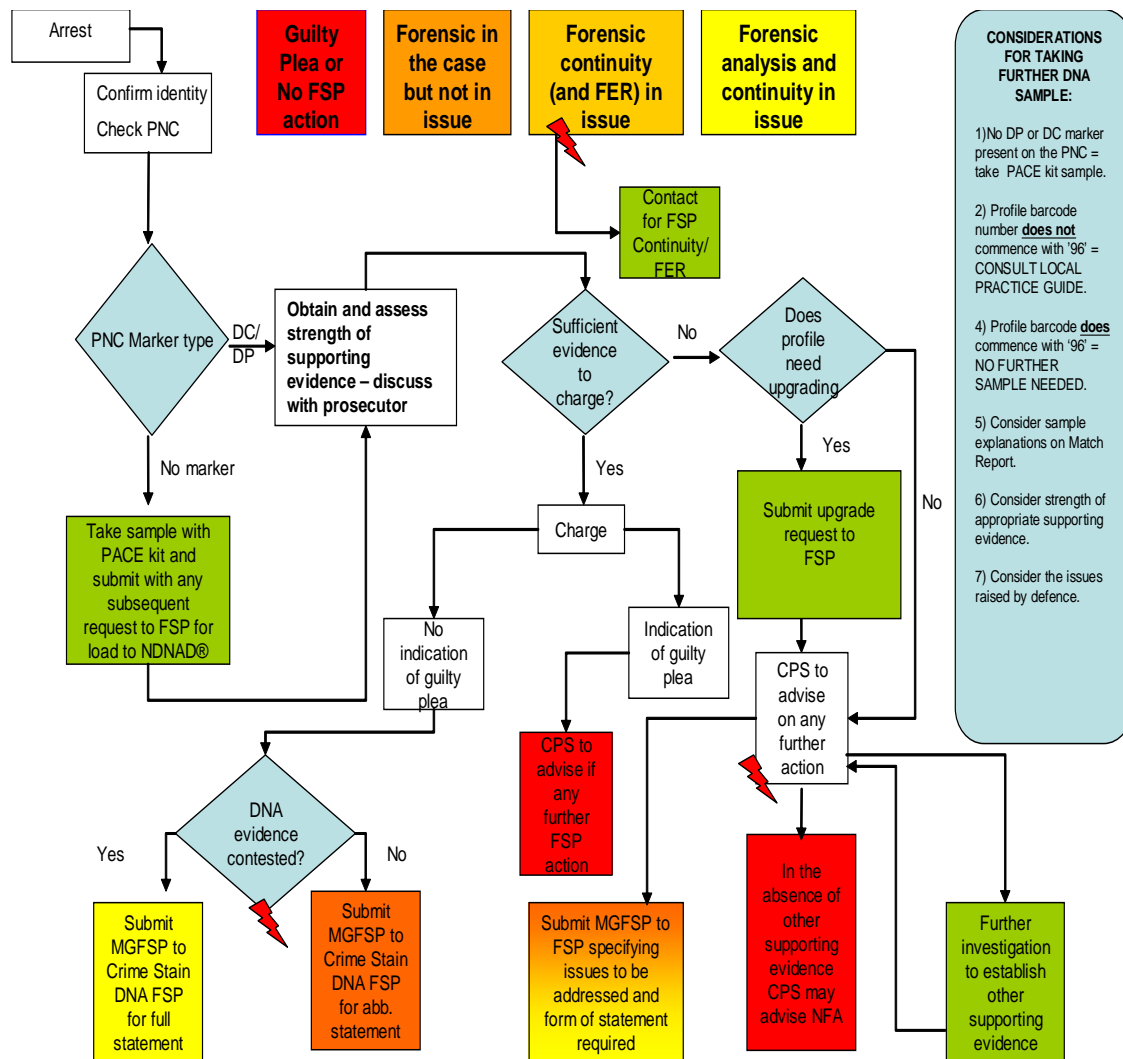
FORENSIC SUPPLIER

- Check and endorse that the contents of the sealed boxes match those recorded on the manifest
- Receive and analyse sample
- Record the details of the sample submission and create a record (FER) for each sample throughout its processing.



NATIONAL DNA DATABASE CUSTODIAN

APPENDIX FIVE PROCESS FLOW – CPS GUIDANCE FOR POLICE



GLOSSARY OF TERMS AND ABBREVIATIONS

ACPO

Association of Chief Police Officers

Arrestee

An Arrestee is an individual who have been arrested for a recordable offence and is detained at a police station.

A-SNPs (autosomal single nucleotide polymorphisms)

This method of DNA analysis is designed to target very small lengths of DNA so that even degraded DNA that has broken into small fragments can be analysed

Buccal swab

Mouth swab used to take DNA samples from individuals

CW (case work samples)

A CW sample was taken from the suspect using a DNA2 kit with a view to detecting a link to a crime scene or to eliminate an individual. It would have been processed to evidential standards. It has now been replaced by samples taken using the PACE DNA sampling kit

Chair of the NDNAD board

Currently Mr Tony Lake, Chief Constable of Lincolnshire

Chance match

A chance match is a match between two DNA profiles that are not from the same person. A chance match is more likely to occur when partial or SGM profiles are involved. Consequently, it is important to upgrade the DNA profile and/or obtain additional evidence

Continuity

This term defines the need for the prosecution to have a proper audit trail in relation to the exhibits relied upon in any case. The prosecution must be able to satisfy the court that there has been no break in the chain for the handling of any exhibit. This is usually achieved by obtaining statements from all individuals who have any dealings with an exhibit

CPS

Crown Prosecution Service

CS (crime scene) samples

A CS sample is a sample taken from a crime scene by a CSI or medical practitioner. It is analysed to evidential standards and compared with any other DNA samples relating to the offence. If no match is found, the profile will be added to and searched against profiles of individuals retained within the NDNAD. The CS sample will be retained by the laboratory

CSI (Crime scene investigator)

A person who has been trained and authorised to examine scenes of crime and to recover evidence which can be assessed by a forensic science laboratory

CJ (Criminal Justice sample)

A CJ sample was a sample taken from an individual who had been arrested, charged, reported for, cautioned or convicted of a recordable offence, using a DNA 1 kit. These samples are now taken using a PACE DNA sampling kit. They are analysed by a laboratory and retained; the record of the profile obtained is sent to the NDNAD for searching against all the profiles held there. They will be continuously searched thereafter against profiles from crime scenes and other individuals on record

Custodian of the NDNAD

The Custodian of the NDNAD acts on behalf of the Association of Chief Police Officers (ACPO). The Custodian is responsible for the integrity of the records held on the NDNAD and for notifying police forces of any matches generated by the NDNAD (Section 1.9)

DNA

Deoxyribo-Nucleic Acid is a molecule found in most cells of all people, animals, plants and other organic matter. The cells are the building blocks of any living organism, of which the human body has countless millions. Variations in the DNA code are responsible for physical differences between individuals including sex, height, hair and eye colour

DNA operations group

This group represents all forces, suppliers and the Home Office. It provides tactical and operational guidance on all matters relating to DNA and reports directly to the NDNAD Board. ACC Stuart Hyde, West Midlands Police, currently chairs the group

Familial searching

Familial searching is a process which allows potential relatives of offenders to be identified on the NDNAD when the offender's profile is not on the NDNAD. It is based on the premise that the DNA profiles of individuals who are related to each other are more likely to contain similarities than the DNA profiles of two unrelated individuals

FER (Forensic examination record)

This continuity log provides details of all assistants who have handled an exhibit or material derived from an exhibit. It is used to avoid the need to provide full continuity statements when the defence do not dispute the continuity evidence.

FSP

Forensic service provider

FSS

Forensic Science Service

Intelligence led screens

An intelligence led screen is conducted when, during major crime investigations, it is desirable to seek a DNA sample, on a voluntary basis, from a number of people who may possibly have some association with a crime or crime scene. This is, principally, with a view to eliminating them from the enquiry. These samples are used only for comparison with the relevant crime scene(s). They are then usually destroyed, unless separate written consent has been obtained from the volunteer to have the profile loaded to the NDNAD

Mitochondrial DNA

Mitochondrial DNA is found in the mitochondria of the cell and is associated with the energy production functions of the cell. Its analysis is very different from that of the DNA found in the cell nucleus and mitochondrial DNA profiles are not compatible with the DNA profiles on the NDNAD. Mitochondrial DNA profiles are less discriminating than STR profiles (SGM/SGM+) but are useful when STR profiles cannot be obtained

NDNAD

National DNA Database

NCOF

National crime and operations faculty, Section 1.12

PACE

Police and Criminal Evidence Act, 1984

PACE DNA sampling kit

A PACE DNA sampling kit is used to take DNA samples from individuals who have been arrested for a recordable offence and are detained at a police station. All samples taken using a PACE DNA sampling kit are processed to an evidential standard and the DNA profile obtained will automatically be added to the NDNAD

Partial profiles

An SGM profile is a partial SGM+ profile. Partial profiles may also result when a CS sample is deficient in either quantity or quality and it has only been possible to obtain part of the potential profile. This limited information will inhibit the comparison that can be made between the suspect and the CS sample. It is advisable to contact the scientist who analysed the CS sample, as they may be able to give an indication as to the strength of the potential evidence

Paternity analysis

This is the analysis of DNA to determine the parentage of a child by comparing the DNA profile of the child with the DNA profiles of the mother and the alleged father

PED (Police elimination database)

The PED contains DNA profiles of police officers, crime scene investigators and police ancillary personnel who are in a position to cause contamination inadvertently. The profiles of most operational police officers are now included on the PED. Section 1.14

Pendulum

This is a software programme that can produce a list of “best fit” profiles when analysing mixed profiles

Phoenix

Phoenix is the name given to the upgraded version of the Police national computer

PNC

Police National Computer

SGM

Second Generation Multiplex – 6 DNA sites

SGM+

Upgraded SGM (from 1999) – 10 DNA sites

SIO

Senior Investigating Officer

SSM

Scientific Support Manager

STR (short tandem repeat) profiling

The current method of DNA profiling is known as profiling Short Tandem Repeats (STR profiling). This technique looks at specific short lengths of the DNA. These short pieces are repeated, end-to-end, within the DNA molecule. Different people will have different numbers of repeats of these pieces and hence different lengths of this repeated DNA. The STR profiling technique examines the length of these repeat units and converts the length into a numerical output

Volunteer DNA sampling kit

The Volunteer DNA sampling kit is used to take DNA samples from volunteers, victims and others whose profile is required for elimination purposes e.g. during intelligence-led screens

Y-STRs (Y-chromosome short tandem repeats)

Analysis of the short tandem repeats (STRs) on the Y-chromosome can demonstrate relationships between male members in a family

Y-SNPs (Y-chromosome single nucleotide polymorphisms)

Y-SNPs are markers on the Y-chromosome that are inherited down the paternal line. The Y-SNPs change very little between generations and it is possible to use the analysis of Y-SNPs to infer an individual's possible ethnicity.

All comments should be addressed to:

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