

# **Codes of Practice and Conduct**

**Protocol: DNA contamination detection -The  
management and use of staff elimination DNA  
databases**

**FSR-P-302**

**Issue 2**

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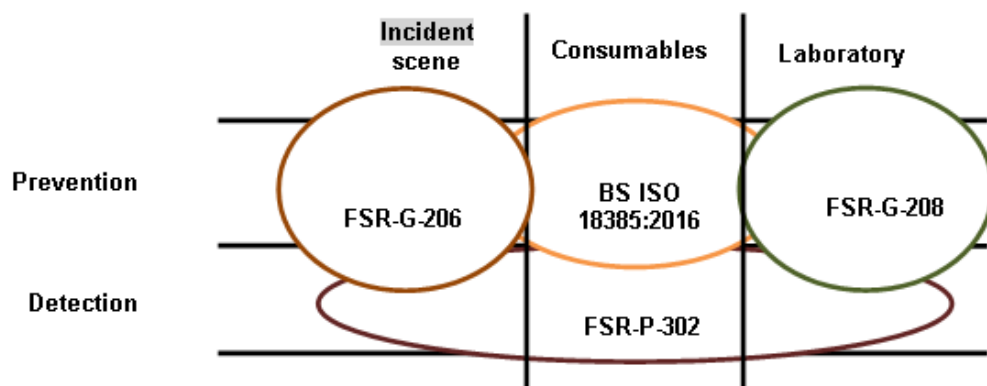
## 1. Introduction

- 1.1.1 The purpose of this protocol is to preserve the integrity of forensic DNA evidence and databases by identifying and preventing the addition of DNA profiles derived as a result of contamination from individuals involved in the DNA process chain. Policies and procedures implemented to achieve this aim shall demonstrate respect for the privacy of individuals and compliance with the Data Protection Act 2018 with respect to holding relevant and accurate data.
- 1.1.2 Contamination events from individuals involved in the DNA process chain that have not been detected have:
- a. misled police investigations;
  - b. wasted resources associated with significant costs; and
  - c. delayed cases reaching a judicial conclusion through the courts.
- 1.1.3 For the purposes of this protocol, contamination is defined as “the introduction of DNA, or biological material containing DNA, to an exhibit or sample during or after its recovery from the scene, or from a person”. This is distinct from the adventitious transfer of biological material to an exhibit or sample that can also occur, usually prior to the exhibit or sample being recovered and before investigative agencies have intervened.
- 1.1.4 This protocol is intended to assist in the assessment of forensic science providers, police force scientific units and any other functions as appropriate against BS EN ISO/IEC 17025 [1] for which the operation of an effective staff elimination database is considered to be a prerequisite in order to achieve accreditation and demonstrate compliance with the Codes of Practice and Conduct for Forensic Science Providers and Practitioners in the Criminal Justice System (the Codes) [2].
- 1.1.5 This protocol should be used in conjunction with quality standards for consumables and other anti-contamination guidelines concerned with the prevention of contamination developed by the Forensic Science Regulator:
- a. PAS 377:2012 Specification for consumables used in the collection, preservation and processing of material for forensic analysis [3];

- b. BS ISO 18385:2016 Minimizing the risk of human DNA contamination in products used to collect, store and analyse biological material for forensic purposes [4];
- c. FSR-G-206 The Control and Avoidance of Contamination in Scene Examination involving DNA Evidence Recovery;
- d. FSR-G-207 The Control and Avoidance of Contamination in Forensic Medical Examinations; and
- e. FSR-G-208 The Control and Avoidance of Contamination in Laboratory Activities involving DNA Evidence Recovery Analysis.

1.1.6 The interaction of these guidelines and standards is shown in Figure 1.

Figure 1. Interaction of anti-contamination guidelines



1.1.7 From a forensic science perspective, investigation activities can be considered as two distinct phases:

- a. the pre-submission phase (scene/victim/suspect), during which investigative agencies are involved in locating, recovering, packaging, storing and transporting exhibits; and
- b. the analytical phase (laboratory) in which the recovered exhibit is processed within a laboratory.

1.1.8 Contamination can occur at any point in these investigation phases. The principal sources of DNA contamination are:

- a. from personnel to exhibit/DNA sample;

- b. from contaminated consumables (for example, swabs, tubes) to exhibit/DNA sample; and
- c. from exhibit to exhibit or sample to sample.

1.1.9 Anti-contamination measures fall into two core areas of activity.

- a. Prevention of contamination as far as is practicable. Preventative measures entail:
  - i. minimising the chance of contamination occurring by, for example, staff using barrier clothing;
  - ii. restricting access to areas containing exhibits;
  - iii. cleaning laboratory surfaces;
  - iv. rendering consumables human DNA-free; and
  - v. ensuring that equipment used at scenes is adequately decontaminated between scenes.
- b. Detection of contamination primarily entails:
  - i. comparison of DNA profiles generated from items against a database of reference DNA profiles from personnel from whom there is a significant risk of contamination;
  - ii. cross-checking of profiles within the same batch of samples and from different batches of samples processed within the same laboratory; and
  - iii. the investigation of unexpected results.

## 2. Scope

2.1.1 This protocol provides the requirements and recommendations on the management and use of elimination databases as a primary means of detecting contamination.

2.1.2 This protocol builds on the Regulators Codes of Practice and Conduct for Forensic Science Providers and Practitioners in the Criminal Justice System [2], which stipulates that processes and procedures for the management of contamination for trace evidence shall be in place. This will require as a minimum, elimination databases of laboratory staff, internal/external visitors and



contractors, police, incident scene examiners, forensic healthcare practitioners and consumables manufacturers.

2.1.3 This protocol applies to England and Wales. Scotland and Northern Ireland should also institute parallel arrangements for their jurisdictions and databases.

### **3. Implementation**

3.1.1 This protocol is available for incorporation into a forensic science provider's quality management system from the date of publication. This protocol came into effect from April 2015.

### **4. Modification**

4.1.1 This is the **second** issue of this document.

4.1.2 The modifications made to create Issue 2 of this document were, in part, to ensure compliance with The Public Sector Bodies (Websites and Mobile Applications) (No. 2) Accessibility Regulations 2018. There is an updated copyright statement, some reformatting, and provision of text alternatives where information has been presented in a non-text format.

4.1.3 Parts of this document which have been significantly altered from the previous issue are highlighted in grey and are listed at 4.1.4. The nature of these changes is not detailed, but changes such as those required to correct spelling and grammar and to update references which are altered by the passage of time are not included.

4.1.4 The following paragraphs contain substantive changes from the previous issue of this document: Copyright, 4, 7,8 and Further Reading.

4.1.5 The Regulator uses an identification system for all documents. In the normal sequence of documents this identifier is of the form 'FSR-#-###' where (a) the first '#' indicates a letter to describe the type or document and (b) '###' indicates a numerical, or alphanumerical, code to identify the document. For example, this document is FSR-P-302. Combined with the issue number this ensures each document is uniquely identified.

4.1.6 In some cases, it may be necessary to publish a modified version of a document (e.g. a version in a different language). In such cases the modified version will have an additional letter at the end of the unique identifier. The identifier thus becoming FSR-#-####.

4.1.7 In all cases the normal document, bearing the identifier FSR-#-####, is to be taken as the definitive version of the document. In the event of any discrepancy between the normal version and a modified version the text of the normal version shall prevail.

## 5. Terms and Definitions

5.1.1 In addition to the terms and definitions set out in the Glossary (Section 28) those in the Codes of Practice and Conduct for Forensic Science Providers and Practitioners in the Criminal Justice System apply to this protocol. For the purposes of this protocol, abbreviations and acronyms are listed in section 27, Abbreviations and Acronyms.

5.1.2 The word 'shall' has been used in this document where there is a corresponding requirement in ISO/IEC 17025 [1] or the Forensic Science Regulator's Codes of Practice and Conduct for Forensic Science Providers and Practitioners in the Criminal Justice [2]; the word 'should' has been used to indicate generally accepted practice and the word 'may' has been used for recommendations.

## 6. Accommodation and Environmental Conditions

### **ISO/IEC 17025:2017 sec.6.3; Codes sec. 20**

6.1.1 It is recognised that DNA contamination incidents cannot be eliminated completely, given the prevalence of human DNA within the environment in which we both live and work. The issue is exacerbated by the increasing sensitivity of DNA analytical techniques. Therefore, an effective DNA anti-contamination process requires a combination of approaches to both minimise the risk of occurrence (ISO/IEC 17025 ref 6.3.3) and to maximise the ability to detect contamination when it does occur (ISO/IEC 17025 ref 6.3.4) [1].

- 6.1.2 Following batch profile integrity checks and prior to the submission of DNA reference or casework profiles to the National DNA Database® (NDNAD) or prior to communicating the casework results to customers and stakeholders in the criminal justice system (CJS, This applies to prosecution, defence and criminal case review authorities), the DNA profiles shall be compared against:
- a. the Laboratory Staff Elimination Database (SED) profiles;
  - b. the relevant subset of profiles pertaining to the investigating police force and, where appropriate, forensic healthcare practitioners; and
  - c. profiles of manufacturing staff relevant to the consumables used by the police force and laboratory/forensic science provider (FSP) (ISO/IEC 17025 ref 6.6) [1].
- 6.1.3 Searches against the relevant elimination profile data sets shall also be conducted for profiles that do not meet the aforementioned criteria (for example, mixed profiles or a partial profile derived from a mixture) and those being used for investigative purposes (ISO/IEC 17025 ref 6.6 [1]).
- 6.1.4 Exceptionally, under urgent circumstances results may be communicated prior to the elimination databases check, but the fact that contamination checks have yet to be completed shall be made known to the customer and stakeholders (ISO/IEC 17025 ref 6.6.3 [1]).
- 6.1.5 Where relevant checks against appropriate staff elimination profiles is not possible for whatever reason, then this shall be made known to the customer and stakeholders, for example, by the use of an appropriately worded caveat.
- 6.1.6 All instances where a match against an elimination profile is observed shall be investigated (ISO/IEC 17025 ref 7.10 [1]). The approach shall be on the basis that there is an innocent explanation for the match (see Section 18).

## **7. Management of Personnel Who Pose Risk of Contamination**

### **7.1 Police personnel**

7.1.1 The risk of DNA contamination from police personnel has long been recognised and a Police Elimination Database (PED) has been in existence since 2000. From April 1, 2003 there has been a requirement for all new recruits to provide a DNA sample for inclusion on the PED and since October 2012, for new recruit profiles to be compared against the National DNA Database® (NDNAD) on a one-off basis as part of the vetting procedure.

7.1.2 In February 2018 changes were made to cease loading new records to the PED, with any further loads being straight to the Contamination Elimination Database (CED).

### **7.2 Management of profiles from high risk police personnel**

7.2.1 High risk individuals shall be screened automatically and routinely against all DNA **trace/stain** profiles and reference profiles generated from material collected by their own police force. For certain roles there will also be a requirement to screen profiles generated by bordering forces with which an individual may undertake overlapping operational activities. Roles and organisational structures can vary significantly between forces, so each force should conduct its own risk assessment of roles, but in general the following are considered to be high risk.

- a. All scene-going staff as all such roles are considered high risk even if, for example, the individual in question is solely a footwear-mark examiner or fingerprint officer.
- b. All personnel involved in seizure of exhibits in planned operations, including **firearms and** drugs officers who may handle exhibits either at the scene or within a laboratory prior to submission for DNA analysis.

- c. Evidence-related property officers, including those handling or opening exhibit bags and splitting those incorrectly containing more than one exhibit.
- d. Custody officers, prisoner handlers and others recovering evidence and handling exhibits in custody suites, including those involved in taking buccal scrapes from detainees for submission to the NDNAD.
- e. All personnel involved in handling unpackaged exhibits, i.e. police laboratory staff, including those searching for trace evidence material and screening exhibits. The provision for these staff shall meet the same requirements as those for laboratory staff working for forensic science providers (FSPs) as set out in section 7.7.

7.2.2 Police forces must satisfy themselves that all high risk personnel (defined above) have provided a sample. Those not yet on the CED and who do not volunteer a sample shall either be moved to a low risk role, or their terms and conditions of employment shall be changed, through appropriate consultation, to make inclusion on the CED a requirement.

### **7.3 Management of profiles from low risk police personnel**

7.3.1 Police roles other than those specifically identified as high risk shall be considered as low risk, for example, members of community policing teams. Profiles from low risk individuals shall not be screened unless this is required in particular case circumstances, for example, where an officer attends the scene of a serious incident when this is not part of their regular role. Under these circumstances, a record shall be kept of all attendees entering the scene, as per police policy nationally. As part of the investigation, the Senior Investigating Officer or another senior police officer shall typically authorise comparison of profiles from all individuals attending the scene against any recovered DNA trace/stain profiles.

7.3.2 The Police Regulations 2003 provided the basis for samples to be obtained from new police recruits. Since the 1st April 2015, Law Enforcement Agencies have been permitted by the Police (Amendment) Regulations 2015 to take DNA samples from all serving Police Officers and Special Constables who are at high

risk of contaminating the DNA supply chain. These records were originally added to the PED, but are now directly loaded to the CED.

## **7.4 Additional non-police personnel**

7.4.1 It is recognised that there are additional groups of non-police personnel, who through their roles may also pose a risk of contamination. These include:

- a. vehicle recovery officers;
- b. paramedics, doctors, ambulance staff;
- c. personnel engaged in running DNA proficiency trials;
- d. partner agency staff, for example, social services, those involved in securing premises (boarding up doors and windows, etc); and
- e. personnel working for FSPs who do not undertake DNA analysis but do nevertheless examine items (such as mobile phones) that could subsequently be the subject of DNA analysis.

7.4.2 Whilst it may not be proportionate to have elimination profiles for all such groups routinely, it is recommended that provision be made for any instance where this could become an issue.

## **7.5 Forensic medical practitioners**

7.5.1 All individuals who routinely enter medical examination rooms, post-mortem facilities or any other rooms used for the examination and recovery of evidential material from either living or deceased victims of crime, shall provide DNA samples for elimination purposes. These include the following groups of individuals.

- a. All staff working within Sexual Assault Referral Centres (SARC) i.e. forensic healthcare practitioners, crisis workers, cleaning staff and other SARC staff. Translators, family members or friends, who may be present during a medical examination at the request of the victim are not required to provide an elimination sample but their details shall be recorded in case there is a need to obtain an elimination sample at a later stage in the investigation.

b. All staff working within post-mortem facilities, including pathologists.

7.5.2 The sampling process, including the wording of consent forms, retention criteria and destruction of unused material are as per laboratory/FSP staff and visitors procedures (see sections 7.9, 7.10, 10 and 11).

7.5.3 Data recorded are the same as for police personnel records, including the details of the police force(s) for which the medical examinations are undertaken and of the particular facility in question.

## **7.6 Manufacturing staff**

7.6.1 All parts of the criminal justice system (CJS) involved in the processing and analysis of DNA evidential material should utilise consumables, where these are available, that are free of detectable human DNA and comply with:

- a. PAS 377:2012 [3] Specification for consumables used in the collection, preservation and processing of material for forensic analysis; or
- b. ISO 18385: 16 Minimizing the risk of human DNA contamination in products used to collect and analyse biological material for forensic purposes [4] for Forensic DNA grade consumables.

7.6.2 Manufacturers and assemblers of consumables and kits shall establish and maintain an up-to-date collection of DNA profiles from all personnel with access to the manufacturing/assembly work environment and who pose a risk of contaminating the consumables with their own DNA. These can be held in an anonymised form, but ideally a master list should be maintained as per section 13 for FSP staff. This potentially enables the source of contamination to be pinpointed to a specific individual, which facilitates the adoption of effective improvement and corrective actions.

7.6.3 A risk assessment process shall be used to establish the scope of the DNA profile collection, as stipulated in PAS 377:2012 [3]. For example, personnel who are involved in physically handling the consumables should be included, as opposed to others who are involved in distribution of materials and are only handling boxes of packaged items. The risk assessment should also consider,

where appropriate, the personnel involved in the supply of raw materials used in manufacture.

7.6.4 The anonymised profiles from manufacturing staff shall be provided to create a collection of profiles for contamination detection purposes, i.e. the Manufacturers Elimination Database (MED). The data format shall meet the requirements for international DNA databases, including the country in which the individual is working as this may impact on the investigation process. Manufacturers may elect to provide this information directly to a centrally held and maintained MED or may provide DNA samples from the relevant personnel to an accredited DNA profiling provider to undertake profiling and submit the profiles on their behalf, for inclusion on the MED.

7.6.5 Manufacturer staff elimination databases are now standard for major DNA kit and consumable manufacturers and kit assemblers, these might be locally held by the manufacturer, third party provider such as a forensic science laboratory or the International Commission on Missing Persons (ICMP) exclusion database.

## **7.7 Laboratory staff/forensic science providers**

7.7.1 Police laboratory staff are included in this category and shall meet the same requirements as laboratory staff in FSPs.

7.7.2 Each DNA profiling provider/FSP shall establish and maintain a laboratory Staff Elimination Database (SED) for against which DNA profiles from casework and reference samples shall be compared for elimination purposes only (ISO/IEC 17025 ref 7.7 [1]).

7.7.3 The DNA elimination data shall contain profiles from laboratory trace evidence recovery staff, DNA processing staff, staff involved in sample reception, plus contractors and visitors who enter DNA-sensitive areas.

7.7.4 It shall be a condition of employment for new members of laboratory/FSP staff to give written consent to provide a DNA sample for profiling, and for this profile to be held on the SED. Where existing members of staff do not have this



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requirement in their original employment contract, they shall either give written consent to provide a DNA sample for the **SED**, or their terms and conditions of employment shall be modified, through appropriate consultation, to include this as a requirement.

7.7.5 Reference DNA samples shall be taken as part of the induction process for new staff and before they enter a DNA-sensitive area.

7.7.6 All contractors and visitors who require entry to a DNA-sensitive area shall give written consent for their DNA profile to be entered on the **SED** and provide reference DNA samples prior to entry. Where possible, they should also be given advance notice of this requirement before arriving on site.

7.7.7 The **SED** shall also contain unsourced contaminant profiles, **these shall also be provided to FINDS for loading to the Contamination DNA Database (CDD) and searching against the CED**. These are primarily profiles observed in negative controls and consumable batch tests, i.e. laboratory-owned quality data (ISO/IEC 17025 ref 7.7 [1]).

## 7.8 Unsourced contaminants

7.8.1 DNA profiling providers/FSPs shall search profiles that are categorised as unsourced (these include negative controls and consumable batch test results) against an appropriate MED. Any non-matched profiles shall be submitted and held as a subset of the centrally maintained MED **and CDD**, so that a current pooled collection of these profiles is used to search against profiles from all DNA profiling providers/FSPs. Profiles should meet the minimum load criteria for partial profiles to the MED/**CDD**. This effectively constitutes an unconfirmed supplement to the MED/**CDD**, the value of which is maximised by having the widest possible usage and contribution. This shall be regularly checked to remove duplicate profiles and **depending on retention regimes** those for which a source has been identified. Consideration should be given to the minimum load criteria and the accepted match criteria for determining a match to an individual as a profile containing less than 12 alleles could be adventitious.

## **7.9 Sampling**

7.9.1 Loading a reference DNA profile from an individual to the CED does not require consent; the lawful basis for processing a DNA record, derived from the sample provided, is for the purposes of identifying contamination. The processing of the DNA record is necessary to perform the task of eliminating innocent individuals, who have inadvertently contaminated a DNA sample or crime scene exhibit, from enquiries. The reason for processing is that it is necessary for reasons of substantial public interest.

7.9.2 The sampling and analysis process is as per the requirements of the DNA profiling provider, who shall use a validated DNA profiling method. The method used must be proven to perform as required and should be covered by accreditation. Once a full designated DNA profile has been generated from a reference sample and quality checks completed, it shall be submitted to the appropriate elimination profile data set.

## **7.10 Destruction of unused DNA material**

7.10.1 Following all quality control checks and confirmation that a full profile has been obtained from a donor, any unused sample, including DNA extract, shall be destroyed. Unless there are demonstrable proportionate reasons to retain any unused sample, including DNA extract, it shall not be retained for longer than six calendar months after the sample has been taken. Consent from the donor to retain their sample for an extended period, or for additional profiling, is a legitimate reason for longer sample retention periods. This time period takes due regard of practice set out in legislation for use of DNA samples elsewhere.

## **7.11 Business continuity**

7.11.1 Business continuity plans are required for the operation of elimination databases for staff within the CJS in England and Wales, and where possible for staff of consumables manufacturers supplying to the CJS, in order to meet the provision to provide checks against ongoing cases, appeals and judicial reviews. In the event of closure or ceasing to provide the elimination database screening service, the organisation shall have in place a process to archive and

transfer the data to an agreed authorised provider or archive (Codes of Practice and Conduct for Forensic Science Providers and Practitioners in the Criminal Justice System, section 6 [2]).

7.11.2 The requirement to transfer the data shall be built into the consent form (see section 10.1.4).

## **8. The Use and Management of DNA Elimination Databases**

### **8.1 Organisation of elimination databases**

8.1.1 A unified approach to the organisation and use of DNA elimination databases comprising locally, nationally (centrally) and internationally managed DNA elimination databases should be agreed nationally by key policy and standards stakeholders. The sole purpose of this is to detect potential contamination from personnel involved in the manufacture of consumables (swabs, tubes, etc.), and the collection and processing of the DNA samples.

8.1.2 Elimination profile data sets shall be established and maintained within which the profiles of the following groups shall be held and compared against trace/stain and reference DNA profiles purely for the purposes of identifying potential DNA contamination events (ISO/IEC 17025 ref 7.7 [1]).

- a. Laboratory/forensic science provider (FSP) staff undertaking processing of evidential samples, and any visitors to the facility who pose a risk of contaminating the DNA samples processed within the organisation, for example, laboratory staff elimination data set (SED).
- b. Police personnel, both officers and civilian staff, for example, national (central) staff elimination data sets, for example, Contamination Elimination Database (CED).
- c. All forensic healthcare practitioners, Sexual Assault Referral Centre personnel, pathologists, and doctors directly or indirectly involved in recovery of evidence from victims of crime, both living and dead, or from

arrested suspects, for example, national (central) staff elimination data sets for example, Contamination Elimination Database (CED).

- d. Personnel directly involved in the manufacture and assembly of consumables used in the collection, preservation and processing of material in order to generate DNA profiles, for example, national (central) or international staff elimination data sets, for example, Contamination Elimination Database (CED), Manufacturers Elimination Database (MED) and/or the ICMP exclusion database.
- e. Unsourced contaminants, the Contamination DNA Database (CDD).

8.1.3 Where it has not proved possible to obtain an individual's profile for the CED, efforts to obtain consent to hold on a local elimination database, for example, laboratory Staff Elimination Database (SED) should be sought unless or until such time as changes in employment terms and conditions can be updated.

8.1.4 Each of these groups shall be held within separate sub-data sets, which shall be maintained completely separately from the National DNA Database® (NDNAD) and should comply with ISO 27001 Information Security Management.

8.1.5 The rationale for having laboratory Staff Elimination databases for DNA profiling providers/FSPs is that these contain profiles of individuals who pose a risk of contamination at a single site or by a single organisation only.

8.1.6 Conversely the CED and MED contain profiles from police and other staff that over time may require checking against different FSP submissions depending on changes in service provider contracts, plus some staff may work for two or more forces that may also use different/multiple FSPs to process their samples. FSPs and police forces may also over time change their consumable suppliers. Hence elimination databases for these groups should be managed nationally as a Contamination Elimination Database (CED) or internationally with authorised access for searching either by multiple individual forensic DNA profiling providers/FSPs or by central/national database operators on behalf of their criminal justice jurisdiction.

## **8.2 Subject access**

8.2.1 Donors have the right to a copy of their DNA profile where it is associated to them as a named individual. On written request, the organisation shall provide them with a certified copy of their personal information stored on the elimination database. This certified copy can be used as a ‘biometric passport’, removing the need to be re-profiled if, for example, the person moves jobs to a different FSP or requires access to DNA-sensitive areas in a different organisation. It will be for the elimination database operator to determine whether a copy of the profile is acceptable and meets the profile requirements for inclusion on their elimination database.

## **8.3 Retention periods on elimination database**

8.3.1 Consideration shall be given to retention periods that are relevant to their role once staff have left and the expected period of time that relevant material handled by them will be in the criminal justice system (CJS) before DNA profiles are generated.

8.3.2 The shelf life of manufactured consumables should be considered for determining the retention period of manufacturing staff data. Laboratory contamination with an 18-month interval has been observed; therefore unless contamination incidence data provide evidence to the contrary, then as a minimum profiles shall be retained for searching for 18 months after staff have left the organisation. In the case of contractors/visitors six to twelve months after last entering a DNA-sensitive area and for police officers in attendance (excluding scene recovery staff and subject to exhibit submission periods) **twelve** months may be more appropriate.

8.3.3 Laboratory Staff Elimination Databases (SED) may consider long-term retention of profiles from specific staff roles in order to facilitate long term case resubmissions and cold case reviews (see section 8.4).

## **8.4 Archive**

8.4.1 The requirement for the archive and the retention period should be determined for each elimination database or staff role, be relevant, proportionate and shall form part of the consent required from staff working within the CJS in England and Wales.

8.4.2 Once the period for retaining a profile on the live elimination database has elapsed for staff exiting the CJS (section 10.1.3) then the data may be deleted or stepped down by either annotating the record, removing the individual's name or transferring the record to an archive, providing consent has been given.

8.4.3 The record could be retained for up to 30 years in order to be available for:

- a. checks against cold cases; and
- b. appeals and judicial reviews.

Retention periods are set out in the code of practice issued under the Criminal Procedure and Investigations Act 1996 for England and Wales. As cases have been tested for DNA after 20 years, then the minimum retention period could be set at 20 years, if deemed appropriate (ISO/IEC 17025 ref 7.11 [1]).

8.4.4 Access and searching against any archived profiles shall be restricted (section 9.1.19) only for the purposes stated above (section 8.4.3).

## **8.5 Interface with international manufacturers elimination databases**

8.5.1 Consumables used in the processes of sampling and DNA profile production are widely used by the police, laboratories/FSPs globally; many examples of profiles from manufacturing staff having been observed in multiple countries have been documented (Sullivan et al., 2004 [5]). With increasing sharing of biometric data including DNA across borders, particularly in Europe as a result of the Prüm Treaty decisions, sharing of information regarding contamination is becoming ever more important if the integrity of the DNA comparisons is to be assured.

8.5.2 The DNA Working Group of the European Network of Forensic Science Institutes is continuing to work towards shared manufacturers and unsourced contaminants databases. The forensic DNA community and FSPs should collaborate with such international initiatives, particularly in sharing unsourced contaminant profiles, including:

- a. collaborations to have reciprocal agreements for facilitating searching of local, central or internationally held MEDs and unsourced contaminant profile records by both UK and international forensic DNA profiling laboratories/FSPs; or
- b. where contaminations checks are carried out after loading to NDNADs, by central/national database operators on behalf of their forensic DNA profiling laboratories as appropriate for the purposes of their criminal justice system.

8.5.3 The International Commission on Missing Persons (ICMP) operates a secure international DNA exclusion database for staff manufacturer profiles and unsourced profiles for the forensic DNA community to maintain their own profiles and/or search.

## **9. Responsibilities and Code of Conduct**

9.1.1 All parties within the criminal justice system (CJS) involved either directly, for example, the police, forensic science providers (FSPs), forensic healthcare practitioners or indirectly, for example, consumables manufacturers, in the processing of DNA samples should recognise that contamination of samples and potential inclusion on the National DNA Database® (NDNAD) is an occupational hazard for workers within the CJS, and that employers have a duty of care to employees to minimise the risk of this happening.

9.1.2 Whilst the occurrence of contamination from personnel within the CJS can be minimised through the adoption of appropriate anti-contamination measures, this risk cannot be completely eliminated. Hence effective management of contamination requires a combination of actions both to minimise the frequency

of occurrence and maximise the chances of its detection through the use of effective elimination databases (ISO/IEC 17025 ref 7.10 [1]).

- 9.1.3 All personnel should be given the option, if they wish, for their profile to be subject to a one-off search against the NDNAD (ISO/IEC 17025 ref 7.10 [1]). This is in response to a legacy issue where people working within the CJS may have been at high risk of contaminating evidential material prior to the implementation of comprehensive and effective DNA elimination checks. For police personnel see section 7.1, but should also be extended to other groups, including forensic healthcare practitioners and consumables manufacturing staff.
- 9.1.4 All matches against DNA elimination databases shall be investigated (ISO/IEC 17025 ref 7.10 [1]) and all investigations shall be undertaken from a standpoint that the match has arisen due to an inadvertent contamination or other innocent circumstances; past experience has demonstrated this to almost always be the case. The Forensic Science Service maintained a comprehensive elimination database comprising both staff and personnel from consumables manufacturers. Over a period of more than a decade several million DNA trace/stain and reference DNA samples were processed and routinely compared against this elimination database. Virtually all observed matches were attributable to contamination occurring either within the laboratory or manufacture of consumables. Only two instances could not be attributed to contamination. On investigation, these were both found to be due to items that were attributable to members of staff being associated with a scene by innocent means. Further use of the matching reference or DNA trace/stain profile shall be put on hold until the investigation has been completed. Responsibility for investigating an identified match lays with the organisation within which it has been observed, for example, the police, FSP, or consumables manufacturer. Outcomes of the investigation shall be fed back to the end user (see section 17.1.2).
- 9.1.5 All investigations shall be undertaken sensitively and discreetly by nominated individuals. The individual being investigated (where known) shall be kept informed of the progress of the investigation, and the exercise should be



undertaken as a means to identify potential improvement actions rather than as a route to disciplining staff, unless it transpires that the individual has repeatedly failed to follow written procedures.

- 9.1.6 Even when anti-contamination procedures have been correctly followed, contamination events are known to occur through no fault of the individual concerned. For example, some people are more prone to shed DNA than others and therefore more at risk than others of contaminating. In extreme cases this can result in an individual repeatedly contaminating with their own DNA despite wearing appropriate protective clothing and correctly following procedures. If all preventative measures fail, then consideration shall be given to moving the individual to a different role.
- 9.1.7 Where an investigation has conducted and the investigator is satisfied that the observed match is explicable through contamination, the police customer shall accept this outcome and the identity of the individual shall not be disclosed; only the alleles in the person's profile that match the DNA trace/stain shall be included in any contamination report.
- 9.1.8 Only in the rare event that the investigation concludes that the match is not explicable through contamination or other innocent means, it may be necessary, depending on circumstances, for the name of the individual concerned (where known), or the name of the organisation if individuals are anonymised, to be divulged to the police via a single point of contact, in order to facilitate further investigation for elimination purposes. For example, knowing whether the manufacturer is UK-based may have a bearing on police considerations regarding the need for follow-up investigations.
- 9.1.9 DNA profiling providers/FSPs and manufacturers shall work together collaboratively to address the issue of contamination of consumables. The fact that contamination cannot be completely eliminated should be the guiding principal. Detection of contamination should be used by FSPs as an opportunity to provide regular feedback to manufacturers to enable continuous review and improvement of their quality procedures, rather than as a reason to undertake legal action against the manufacturer for provision of a non-conforming product.

- 9.1.10 It is the responsibility of police forces to provide up-to-date data to the Contamination Elimination Database (CED), including changes to records and search parameters to ensure that, as far as is practicable, screens continue to be restricted to all relevant individuals and no others. These changes include the following:
- a. CED records, reflecting movement of police personnel from one force to another or exiting the CJS;
  - b. forensic healthcare practitioners records, reflecting any changes of the service provider utilised by a force.
- 9.1.11 Search/trace evidence recovery laboratories shall provide their DNA profiling providers/FSPs with up-to-date information on the consumables that they use so that the relevant manufacturing staff can be searched against these.
- 9.1.12 It is the responsibility of DNA profiling provider/FSP and police laboratories to maintain up-to-date staff elimination profile data sets (ISO/IEC 17025 ref 7.11 [1]).
- 9.1.13 It is the responsibility of manufacturers to maintain a current collection of DNA profiles for contamination detection, and where appropriate to provide up-to-date data to the centrally held Manufacturers Elimination Database (MED) and Contamination Elimination Database (CED), i.e. new profiles, removal of old profiles and update of details.
- 9.1.14 For the MED it is the responsibility of manufacturers, as the data owners, to determine the user communities in addition to forensic DNA profiling laboratories that are authorised to check against their elimination profile records; these may, for example, include organisations that provide testing for them, produce reference DNA materials or generate proficiency test samples.
- 9.1.15 It is the responsibility of the MED operator(s) to establish the user communities in addition to forensic DNA profiling laboratories that are authorised by the manufacturers to check against the elimination profile records being held and processed on their behalf.

- 9.1.16 It is the responsibility of the elimination database operator(s) to ensure that they are registered with the Information Commissioner’s Office, unless they are exempt, as failure to do so is a criminal offence.
- 9.1.17 It is the responsibility of the elimination database operator(s) to establish ownership of the data, whether they are the data owner (for example, data from their own staff), the data processor (for example, holding and processing data from other organisations) or both. It is important to clarify who the data controller is and ensure compliance with the **Data Protection Act 2018** for organisations based in the UK (ISO/IEC 17025 ref 7.11 [1] and the Codes of Practice and Conduct for Forensic Science Providers and Practitioners in the Criminal Justice System (the Codes), 23 [2]). For manufacturers based overseas, the data protection laws relevant to their own country shall be observed.
- 9.1.18 It is the responsibility of the elimination database operator(s) to demonstrate that the software and algorithms used are appropriate and fit for purpose (the Codes 23 [2] and ISO/IEC 17025 ref 7.2 and 7.7 [1]).
- 9.1.19 Security of the elimination database records shall be maintained by enforcing restricted access to nominated authorised individuals, and through working practices that ensure compliance with the **Data Protection Act 2018**. The data shall be backed up and transmitted in accordance with the Government’s Security Policy Framework (ISO/IEC 17025 ref 7.11 [1] and the Codes 23 [2]).
- 9.1.20 Procurement functions shall ensure that consumables purchased for the collection, retention and processing of DNA samples comply with BS ISO 18385:206 [4], where these exist and are appropriate (ISO/IEC 17025 ref 7.1, 7.3, 7.4 and 7.5 [1]).
- 9.1.21 It is the responsibility of laboratories/FSPs and police forces to inform their consumable suppliers of the importance for the manufacturing staff to provide elimination DNA profiles to the MED as appropriate.
- 9.1.22 DNA profiling providers/FSPs shall provide the **CDD** with regular updates of contamination profiles that are categorised as unsourced, so that a current

pooled collection of these profiles is used to search against profiles from all FSPs. This effectively constitutes an unconfirmed supplement to the MED, the value of which is maximised by having the widest possible usage and contribution (ISO/IEC 17025 ref 7 [1]).

## **10. Consent Form (see also section 23)**

10.1.1 Where appropriate, individuals entered on to an elimination database shall sign and date a consent form that provides consent for providing the sample and confirms the basis on which a sample is provided, this should include but is not limited to the following.

- a. The organisation is authorised to collect a DNA sample and generate a DNA profile from it.
- b. The organisation shall provide a written explanation with the consent form explaining the management of the elimination database, including how investigations are conducted in the event of a match and arrangements for retention and removal of profiles, both on a routine basis and on request.
- c. The results will be used solely for comparison with profiles generated from casework or reference samples in order to detect contamination incidents. Where contamination is observed, investigations are targeted towards identifying improvements rather than disciplining staff.
- d. The organisation will retain a copy of the results of the tests performed on the sample, ideally with the metadata and profile stored separately and not accessible except by a restricted number of staff to conduct investigations. The organisation will not disclose the information in any way other than as authorised in the consent form, or as may be required by law.
  - i. Specific authorisation may be sought on the form for limited disclosure of the profile to other accredited forensic providers where necessary, and following agreement between the respective Human Resources departments (see section 21).
  - ii. In the event of the operator of the elimination database ceasing to operate the data are transferred to another authorised operator or

archive that meets the existing security and legal requirements of the organisation that owns the data to be transferred.

- 10.1.2 The individual agrees to provide a DNA sample on a voluntary basis if it is not part of their terms and conditions of employment, and the profile will not be uploaded to the National DNA Database® (NDNAD) nor compared against it except with their explicit permission, although the latter is strongly recommended for individuals exiting employment within the criminal justice system (CJS).
- 10.1.3 Profiles will be retained (specified) until the individual no longer poses a risk of contamination once they have left the DNA process chain.
- 10.1.4 After the specified time the individual's profile shall be stepped down in the live elimination database, deleted or transferred to a restricted archive database for cold case review appeals and judicial reviews use only. If this is not part of their terms and conditions then consent shall be required from staff as appropriate to work within the CJS in England and Wales.
- 10.1.5 If there are any specific proposals to vary the basis on which the data are held or processed, a further specific written consent would be required from the individual who originally provided the profile.
- 10.1.6 Samples for inclusion on the CED are processed on the basis of substantial public interest rather than on the basis of informed consent (see section 7.9.1). An information form rather than a consent form is provided; further detail is available in the CED policy documents.

## **11. Information Recorded and Retained on Elimination Databases**

### **11.1 Data format**

- 11.1.1 As a minimum, entries of information shall use a data format and other configuration parameters that closely align to those defined in the 'DNA chapter 1' of the annex to the EU Council Decision 2008/616/JHA [6] used for the Prüm

DNA data exchange and applications. This allows for interoperability between different elimination databases.

11.1.2 Only unsourced profiles and by agreement with the manufacturer, the Manufacturers Elimination Database (MED) data, shall be shared with other countries.

## **11.2 Data fields**

11.2.1 Each entry shall as a minimum include the following information.

- a. A reference number unique to the individual. Personal information, for example, name shall not be held on any of the elimination databases.
- b. A country code, relevant to manufacturing staff elimination data and laboratory location for unsourced contaminants.
- c. The organisation for which the individual works/data owner/controller.
- d. The multiplex kit(s) used.
- e. The profiling organisation (if this is different to the organisation that the individual works for and is authorised by the data owner/controller to load, amend, delete that profile and for follow-up profile queries).
- f. The sample category (for example, manufacturer, police, medic, contractor, visitor, or an unsourced profile).
- g. A full designated short tandem repeat (STR) DNA profile provided using a validated profiling system.

11.2.2 For local and national (central) elimination database profiles – utilising the current standard multiplex in use and that meets the allele reporting requirements determined from the validation of the method used or the load criteria set for the National DNA Database® (NDNAD).

11.2.3 For MED profiles – utilising a multiplex that provides comprehensive coverage of the European Standard Set of loci (ESS) and the United States Combined DNA Index System (CODIS) loci in use globally, but as a minimum it should include all DNA 17 loci. This is to account for the fact that consumables will be used for processing samples using any number of STR multiplex kits and will allow any users of these consumables to carry out meaningful searches for

manufacturer contamination regardless of which STR profiling system is used by them.

- 11.2.4 The exception is for unsourced contaminants – as a minimum this shall be a partial profile utilising the current standard multiplex in use that meets the criteria set by the DNA profiling provider/forensic science provider (FSP) for searching their Staff Elimination Database (SED) for matches, and may be lower than the criteria for loading to the NDNAD. For those profiles to be added to the MED or CDD, the minimum load criteria set for that database shall be met. It is recommended when appropriate for inclusion on the MED or CDD that re-profiling is undertaken, utilising a multiplex to obtain a more discriminating profile to minimise occurrence of adventitious matches.
- 11.2.5 For all elimination databases, including the MED, consideration should be given to data fields that indicate archive and deletion dates and a flag for records where the profile is anonymised that any match against that record will not necessarily be traceable to the individual.

## **12. Legacy Profiles**

- 12.1.1 For existing elimination databases the profiles will have been generated using short tandem repeat (STR) multiplexes that have been superseded by more sensitive discriminating STR profiling technology, therefore consideration should be given to re-sampling staff and upgrading profiles if at all possible. The discriminating power of the legacy profiles will have a bearing on the searching and matching regime used against these profiles.

## **13. Additional Retained Information**

- 13.1.1 Ideally Human Resources or an equivalent function or authorised individual, such as the data protection officer, should maintain a master list in which the names of individuals are linked to the unique reference number held within a secure system. Data shall be maintained in compliance with the **Data Protection Act 2018** for UK operators. Overseas manufacturers should give due regard to the legislation of their own country. Access to this list shall be protected and

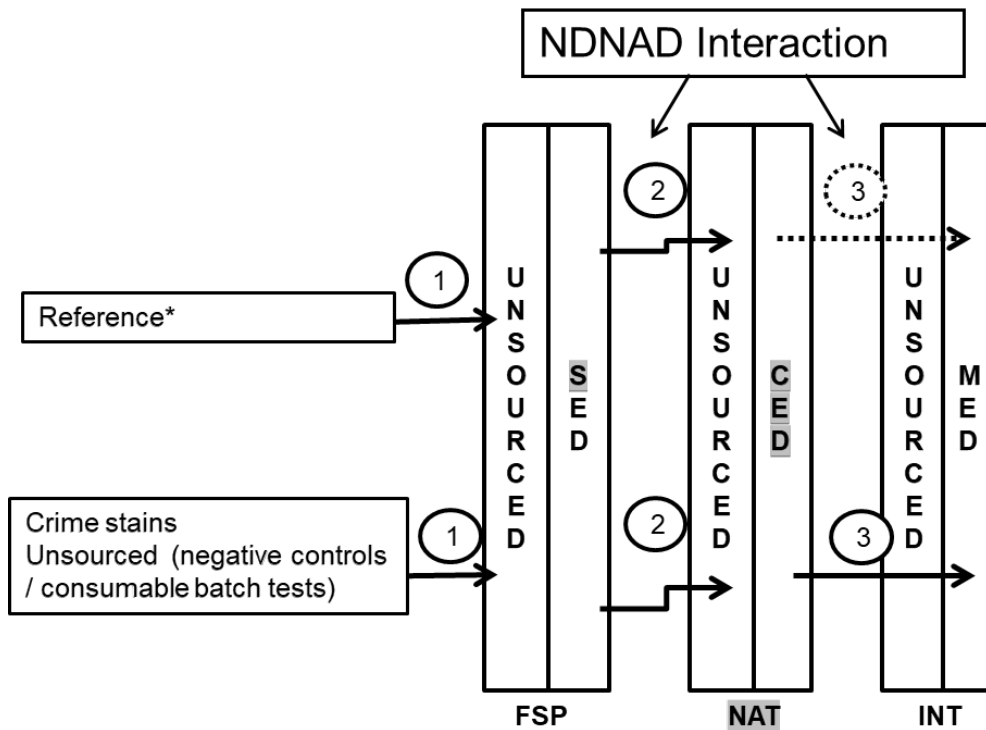
**PROTOCOL – PROTOCOL – PROTOCOL – PROTOCOL – PROTOCOL – PROTOCOL – PROTOCOL – PROTOCOL**

available to only a few nominated authorised individuals permitted to search the data when a specific contamination incident is being investigated.

13.1.2 For manufacturers outside the UK, where national legislation would prevent the name of the individual being held, then information as to the parts of the manufacture process that they are involved in can be recorded to aid identifying possible areas for quality improvements should there be a match against an anonymised DNA profile record.

## 14. Searches Against Elimination DNA Profile Records

14.1.1 An example of a schematic for checking against elimination databases is shown in Figure 2.



\* This is **non duplicated** hair or surrogate (indirect) samples

**3** Local legislation/policy may not permit profiles from individuals to be exported, i.e. search against an international MED

Figure 2: Example schematic for elimination database screening.

14.1.2 All profiles, either single source or component(s) of interest in interpreted mixtures, casework or reference, shall be compared against the relevant



laboratory staff elimination profiles held on the laboratory Staff Elimination Database (SED) and Contamination Elimination Database (CED), plus the relevant subset of profiles pertaining to the investigating police force, including forensic healthcare practitioners, unsourced and manufacturing staff profiles pertaining to the consumables used by the police force and laboratory (ISO/IEC 17025 ref 6.2 and 7.11 [1]) (also see section 6). Wherever possible data input should be automated to avoid DNA profile data errors. Where manual input of the data cannot be avoided then processes such as double entry or a second independent check shall be implemented and documented.

## **15. Searching**

### **15.1 Match regime**

15.1.1 The searching and matching regime shall optimise the identification of contaminating profiles but minimise the number of adventitious matches. The regime shall take into account the number of alleles that a forensic science provider (FSP) will use to report:

- a. a statistical match probability to the court;
- b. the minimum load criteria for the local, national and international databases. The load and search criteria for the Laboratory Staff Elimination Database (SED) can be less than that permitted for loading and searching against the Central Elimination Database (CED) and the Manufacturers Elimination Database (MED) as the laboratory staff Elimination Database (SED) will contain fewer staff profiles to search against, thus will have a higher tolerance to adventitious matches for partial profiles. This will allow for the identification of profiles that are more prevalent but difficult to identify due to the partial nature of the profiles;
- c. the number of elimination records held in the elimination database;
- d. the discriminating power of the elimination DNA profiles held; and
- e. in particular, any legacy profiles and the short tandem repeat (STR) multiplex kit(s) used to generate the profiles being compared.

## **15.2 Same short tandem repeat polymerase chain reaction chemistry/multiplex**

- 15.2.1 For searches against profiles generated using the same polymerase chain reaction (PCR) chemistry/multiplex, demonstrable consideration shall be given to high stringency searching and searching to accommodate for profile anomalies, such as allele mis-designation or omission and the rarer event of a somatic mutation.
- 15.2.2 Demonstrable consideration should be given to ensuring that the searching of profiles is conducted on numbers of alleles that maximise the chances of detecting contamination, yet also minimise the numbers of false positives generated (Codes of Practice and Conduct for Forensic Science Providers and Practitioners in the Criminal Justice System (the Codes), 23.4 [2] and ISO/IEC 17025 ref 7.7 [1]).
- 15.2.3 For a highly discriminating search profile then high stringency matching with an N-1 routine shall be undertaken. N-1 means that the search profile can contain a single designated allele difference at one locus and is not position specific (i.e. can be in either the high or low molecular weight position).
- 15.2.4 The partiality of the profile where N-1 searching is unsuitable should be determined using the considerations listed in (section 15.1.1) (for example, for search profiles with less than 8 alleles present against the **SED** and less than **12** alleles present against the CED and MED).

## **15.3 Different short tandem repeat polymerase chain reaction chemistries/multiplexes**

- 15.3.1 For searches against profiles generated using different PCR chemistries/multiplexes, demonstrable consideration shall be given to high stringency searching and searching to accommodate for profile anomalies such as allele mis-designation or omission and the rarer events of non-concordance and somatic mutations (the Codes 21.2 [2] and ISO/IEC 17025 ref 7.7 [1]).

- 15.3.2 For a partial search profile determined to be unsuitable for N-1 searching as per (section 15.2.4) then high stringency matching shall be undertaken.
- 15.3.3 For a discriminating search profile (for example, 11 to 16 alleles present) then high stringency matching with an N-1 routine should be undertaken.
- 15.3.4 For a highly discriminating search profile (for example, 17 or more alleles present) then high stringency matching with an N-1 routine shall be undertaken. The use of an N-2 routine should also be considered. N-2 means as a minimum that the search profile and the retained elimination database profile contains a single designated allele difference at one locus, of which the loci could be different for each profile and is not position specific (i.e. either high or low molecular weight allele). The relevance of two differences in a DNA trace/stain profile of interest compared with an elimination profile should be considered as a targeted N-2 search condition (for example, for use on search profiles derived from component[s] of interest in interpreted mixtures). The N-2 routine could automatically produce N-1 matches.

## **16. Reporting Matches**

- 16.1.1 A match to a DNA trace/stain or reference DNA profile shall be reported directly to the search requester, typically the DNA profiling provider/forensic science provider (FSP), NDNAD for CED or central/national operator where appropriate, on generation of the match.
- 16.1.2 Where a match against a profile from a consumables manufacturer is observed, the manufacturer should also be notified. See Table 1.

<b>Target profile source</b>	<b>Match against</b>	<b>Match report sent to single point of contacts</b>
Undetected crime stains Reference samples Unsourced (negatives)	<b>SED/CED</b> , for example, laboratory staff i.e. DNA profiling lab/FSP/police force	<ul style="list-style-type: none"> <li>• Target profile owner</li> <li>• Lab/FSP/ police force</li> <li>• (Target profile provider if match generated from CED- PED subset)</li> </ul>
	<b>PED</b> , for example, police officers, CSIs, contractors i.e. force	<ul style="list-style-type: none"> <li>• Target profile owner</li> <li>• Force</li> <li>• Target profile provider</li> </ul>
	<b>MED</b> , for example, manufacturing and kit assembly staff i.e. consumable suppliers	<ul style="list-style-type: none"> <li>• Target profile owner</li> <li>• Manufacturer</li> <li>• Target profile provider</li> </ul>
	<b>CED</b> , for example, forensic pathology, medical and nursing staff – i.e. force contracted to SARC, Department of Health, etc.	<ul style="list-style-type: none"> <li>• Target profile owner</li> <li>• Force/SARC/pathology unit as pre-determined as the staff profile owner on CED</li> <li>• Target profile provider</li> </ul>
Unsourced (negatives)	<b>MED – unsourced</b>	<ul style="list-style-type: none"> <li>• Target profile owner</li> <li>• DNA profile providers (target and matched profiles)</li> <li>• CED</li> <li>• NDNAD data integrity</li> </ul>

Table 1: Guide to where matches should be sent for investigation and follow up.

16.1.3 All demographic information, except for the individual’s name (if it is held), and the search profile submitted alongside the matching loci (including the N-1, N-2 near match) of the nominated profile shall be provided with a unique match reference number, to allow for the distinction between repeat profile searches and for audit, tracking and follow-up purposes.

16.1.4 Following the investigation (see section 18) of the match the organisation shall provide feedback as to the outcome of its investigation to relevant stakeholders.

## **17. Management Information**

17.1.1 Records shall be maintained (ISO/IEC 17025 ref 6.4, 7.5 [1], and the Codes of Practice and Conduct for Forensic Science Providers and Practitioners in the Criminal Justice System, (28.2 [2]) of all reported matches and outcomes of the investigations (see section 9.1.4 and 17.1.3). Contamination rates and trends shall be recorded and periodically reviewed as appropriate within the laboratory/forensic science provider (FSP) quality management review meeting (ISO/IEC 17025 ref 8 [1]).

17.1.2 Records shall be maintained of the matches and outcomes of the investigations and made available on request to the Forensic Science Regulator/designated representative or nationally authorised forensic assurance unit for appropriate reviews/analysis/monitoring of contamination rates and trends.

17.1.3 The details recorded and reported for trend analysis and management information purposes should include the following:

- a. single source or mixture profile result;
- b. full or partial profile match i.e. match probability/confidence;
- c. the type of event i.e. person to person, person to item, item to item;
- d. direct or indirect transfer i.e. primary or secondary transfer;
- e. the stage, process or place in the process where the contamination event occurred i.e. the consumable, equipment, environment, recovery, packaging, examination, sampling, extraction, polymerase chain reaction (PCR) and post-PCR;
- f. time line i.e. especially where indirect contact/secondary transfer is the only feasible explanation;
- g. other relevant information to aid trend analysis, understand mechanisms of transfer and improve anti-contamination good practice, for example, staff repeat incidences, faulty air flow, cleaning regime, storage conditions, skin condition, etc.

## **18. Investigation Process**

### **18.1 Match investigations**

18.1.1 All instances where a match against an elimination database profile is observed shall be investigated. The default position is that there is an innocent explanation for the match.

### **18.2 Match of reference (PACE) sample to a laboratory elimination profile record**

18.2.1 An investigation shall be undertaken to determine if contamination occurred during processing of the Police and Criminal Evidence Act 1984 (PACE) sample, and full records shall be maintained of all instances, investigative steps taken, conclusions drawn and subsequent corrective actions taken. Throughout the investigation, the individual member of staff should be kept fully informed of progress. Investigations may include one or both of the following steps, depending on the circumstances:

- a. the investigation may include processing the second sample (swab), where this still exists due to the constraints of PACE as modified by the Protection of Freedoms Act 2012, as a quality assurance measure; and
- b. if the match was against a member of staff involved in the processing of reference samples, they should not be involved in the reprocessing of the second sample.

18.2.2 If the profile obtained from the second sample does not match the profile from the first, attempts should be made to determine the point at which contamination occurred, by re-extracting and re-amplifying sample 1 and/or re-amplifying the DNA extract from sample 1.

18.2.3 If the profiles from the first and second samples match, this indicates that contamination may not be the only explanation. The DNA profile result shall be loaded to the National DNA Database® (NDNAD) once the **NDNAD proficiency testing team** has confirmed that the match is not due to the individual being a donor of a quality assurance sample used in **a proficiency trial**.

### **18.3 Match of DNA trace/stain profile to laboratory elimination database profile record**

- 18.3.1 An investigation shall be undertaken to determine if contamination occurred during processing of the DNA trace/stain scene sample within the laboratory environment, and full records shall be maintained for each investigative step taken, conclusions drawn and subsequent corrective actions taken.
- 18.3.2 Investigations may include some or all the following steps depending on the circumstances:
- a. the investigation may include reworking the original material, for example, by re-electrophoresis, re-amplification or re-extraction from the stored extract component;
  - b. if the match was against a member of staff involved in the processing of DNA trace/stain scene samples they should not be involved in the reworking; and
  - c. where appropriate, a deep clean should be conducted of the laboratories where the contamination may have occurred and where any re-processing takes place, before re-processing is undertaken.
- 18.3.3 If the profile obtained from the rework no longer matches the original profile (if a single source) or in the case of a DNA mixture no longer contains the components that matched, the rework result may be used for casework analysis or for NDNAD applications, provided all the other required quality criteria are met.
- 18.3.4 If the profile remains unchanged on the reworking of the original material, then the original item should be re-examined and, where possible, attempts should be made to re-sample, i.e. take a new previously unprocessed part of the material, for example, a different area of the same stain or other discrete source of biological material.
- 18.3.5 If the re-sampled material no longer matches the original elimination profile record the rework result may be used for casework analysis or for NDNAD applications, provided that all other required quality criteria are met.

18.3.6 If the re-sampled material still provides a profile that matches against the original elimination profile record, another item linked to the same case or a different stain from the same item should be sought and processed, if these options exist.

#### **18.4 Match of reference (PACE) sample or DNA trace/stain to a contamination elimination database (CED) profile record**

18.4.1 The Investigating Officer and where appropriate the Scientific Support Manager shall be informed that a match to a trace/stain or reference DNA profile has been obtained against a police staff elimination profile, disclosing demographic and matching profile information as agreed in the consent form.

18.4.2 It is the responsibility of the police force(s) involved in the match to investigate and advise the reporting DNA profiling provider/forensic science provider (FSP) whether or not contamination is the accepted explanation for the match and agree any follow-up actions and reporting requirements as necessary.

#### **18.5 Match of reference (PACE) sample or DNA trace/stain to a manufacturing staff elimination (MED) profile record**

18.5.1 The Investigating Officer and the police force single point of contact shall be informed that a match to a trace/stain or reference DNA profile has been obtained against a manufacturing staff elimination profile, providing matching profile information as agreed in the consent form.

18.5.2 Consideration should be given to whether contamination is the accepted explanation, particularly if the consumable manufacturer is not UK-based. The DNA profiling provider/forensic science provider (FSP) shall advise the police force if any follow-up investigation should be undertaken for the match, and agree any follow-up actions and reporting requirements as necessary.

18.5.3 The manufacturer shall be informed that a match to a trace/stain or reference DNA profile was obtained against one of their staff elimination profiles, providing matching profile information as agreed in the consent form, to enable the manufacturer to investigate and feedback. The outcome of the investigation



should be used for continuous review and improvement of its quality and staff training procedures.

## **19. Follow-up Actions in the Event of a DNA Trace/Stain Match Against Laboratory Elimination Database Profile Record**

### **19.1 Actions where contamination is a feasible explanation for the observations**

19.1.1 In virtually all circumstances where the profile from an individual matches that from an exhibit that they have had either direct or indirect exposure to, it is reasonable to believe that this has arisen through innocent means, of which contamination is the likely cause.

19.1.2 The investigation process outlined in (section 18.3.2) is designed to elicit information regarding the probable mechanism by which contamination may have occurred. However, not all investigations into instances of matches against the staff elimination profile can be completed, for example, if insufficient material remains to enable rework to be undertaken, or only a partial profile can be generated. Under these circumstances the conclusions drawn should also be that contamination is the likely cause, but that it cannot be proven. As a guide the following actions should be considered.

- a. Notify all relevant staff (for example, the individual involved, their line manager, the quality leader, and other senior managers as dictated by the severity of the impact of the contamination) on the outcome of the investigation. It is not necessary to disclose the name of the person involved to staff or senior managers that are not relevant to the investigation.
- b. Inform the person involved in the match, or where this person's sample has been anonymised, the organisation for which they work.
- c. Document that contamination may have occurred on the case-file, together with the summary of the investigation (ISO/IEC 17025 ref 7.10 [1]).

- d. Record the incident in the laboratory contamination log (ISO/IEC 17025 ref 7.10 [1]). This should be regularly reviewed to identify trends in contamination and potential improvements to reduce the risk of recurrence. These actions should be captured within the improvement and corrective action process, the operation of which is a requirement of ISO/IEC 17025 (ref 7.10 [1]).

## **19.2 Actions where contamination is not a plausible explanation for the observations**

19.2.1 Circumstances in which contamination is not a plausible explanation for a match are extremely rare.

19.2.2 Typically this is where a discrete item, such as a piece of chewing gum or blood stain, is of sufficient size and DNA yield to enable re-sampling from a separate part of the same item, and this repeatedly yields a full DNA profile matching against the laboratory Staff Elimination Database (SED). Under these circumstances, assuming it is not a quality assurance sample used in an National DNA Database® (NDNAD) proficiency testing trial, the following actions may be required, with the individual in question, where known, kept fully informed throughout.

- a. Disclosure to the investigating police force of the name of the individual concerned where this is known, for example, a member of staff of the forensic science provider (FSP) or police staff.
- b. Disclosure of the organisation for which the matching individual works, where their name has not been provided to the FSP, for example, sub-contractors.
- c. Depending on the circumstances of the case, the police may wish to make further inquiries with the individual in question in order to eliminate them from the investigation.
- d. Disclosure of the incident to senior managers within the relevant FSP, with subsequent actions according to the organisation's Human Resources procedures.

- e. At the conclusion of the investigation a decision should be made in conjunction with the police force on whether the DNA trace/stain profile should be retained or entered on the NDNAD.

## **20. Broader Considerations In Contamination Investigations**

- 20.1.1 Knowledge regarding the mechanisms by which DNA contamination can occur is still developing and will continue to do so in line with the evolution of increasingly sensitive DNA profiling technology.
- 20.1.2 Investigations into contamination events should not just focus on the processing of exhibits for DNA analysis and the events within the rooms in which samples have been processed, but should take a wider view of activities within the entire building. For example, any activities including inspection, cleaning or maintenance of air management systems within the same building, even if remote from DNA clean areas, or any other kind of structural perturbation of the building, increases the risk of contamination occurring. This risk should be addressed by additional non-routine deep cleaning and environmental monitoring as required.

## **21. Collaborative Contamination Checks Between Forensic Science Providers**

- 21.1.1 Where an accredited DNA profiling provider/forensic science provider (FSP) is undertaking analysis on material previously examined by a different DNA profiling provider, it may be necessary to check any new profiles generated against the Staff Elimination Database (SED) of the original examining FSP. Where this is undertaken, the DNA trace/stain profile shall be provided to the original examining DNA profiling provider/FSP for an SED search. Where a match is observed, release of the information is limited to the alleles shared with the DNA trace/stain profile, provided the consent form has explicitly allowed for such disclosure (sections 10 and 23).

## 22. Contamination Report

- 22.1.1 Should the police require a contamination report (ISO/IEC 17025 ref 7.10 [1]) it should be provided.
- 22.1.2 Where a contamination report has been prepared it is revealable and disclosed to the Crown Prosecution Service and should be notified to the police for inclusion in any schedule of unused material prepared for the purposes of criminal proceedings. A summary on the schedule in similar terms to that outlined below might assist the prosecutor in determining whether a report is required, or whether there is a need to disclose.
- a. The contamination report must not identify the person involved by name.
  - b. The report should explain the principles by which the appropriate laboratory Staff Elimination Database (SED), Contamination Elimination Database (CED) or Manufacturers Elimination Database (MED) operates and the nature of investigations undertaken when a match occurs.
  - c. The investigation undertaken should be outlined in the report, identifying the root cause of the observed match and corrective actions taken where appropriate.
  - d. The report should include wording along the lines of:  
“The result/components of the DNA profile obtained from item x has matched a DNA profile held on the laboratory Staff Elimination Database/Contamination Elimination Database/Manufacturers Elimination Database. As the result/the component of the mixture relates to an individual involved with the laboratory analysis/sample handling/manufacturing process, the profile/component of the mixed profile can be assumed to be the result of contamination at the laboratory/scene/manufacture. As such, it has been treated as having no evidential value and has not contributed to my interpretation”.

## **23. Elimination Database Consent Form**

23.1.1 The principles and basis for obtaining consent for elimination samples for inclusion on an elimination database is set out in section 10. An example template that can be customised as appropriate is set out below.

### **23.2 Elimination database consent form template – visitor example**

1. I recognise that in the course of my employment or during my attendance at a scene or visiting a facility processing forensic material, I may come into contact with (select as appropriate):
  - a. items, samples or extracts on which DNA analysis may be required;
  - b. consumables to be used in the collection, storage and processing of samples for DNA analysis.
2. As such there is a possibility that I could inadvertently contaminate these with my own DNA and this could give misleading results.
3. I therefore volunteer to provide a buccal/saliva sample for DNA profiling, and I agree to this profile being held on the Staff/Manufacturers (select as appropriate) Elimination Database.
4. I also agree to this database being used by the Staff/Contamination/Manufacturers (select as appropriate) Elimination Database administrators and authorised forensic science providers to check against profiles generated for intelligence or evidential purposes for contamination, where I have had an opportunity to cause contamination, prior to and/or after their being loaded on to the National DNA Database® or used for casework reporting purposes.
5. I understand that routinely this will involve the checking of each profile generated for criminal justice purposes against relevant staff, scene attendee, contractor and visitor profiles from site or sites where the item, or sample derived from it, or consumables used in the processing of the sample, have been handled.
6. I understand that should I withdraw my consent, my profile will be removed and destroyed six or twelve months (Retention time is dependent on the role,

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access, risk and processing timescales for submission and analysis) after I cease to pose a contamination risk as defined in paragraph 1 above: it will not be transferred to an archive database and I will be notified of its destruction in writing.

7. I attach the following conditions to my agreement.

- a. My DNA profile must not be used for any other purpose than for the detection of accidental contamination.
- b. Should my DNA profile match that of a sample from a scene of DNA trace/stain, this will have to be disclosed to the Investigating Officer, who will assume it to be the result of contamination if this is a reasonable explanation.
- c. Access to information to link my DNA profile with me must be on a strict need to know basis, and all reasonable steps must be taken to eliminate any adventitious match with my DNA profile by analysis at additional loci.
- d. Once I cease to pose a contamination risk as defined in paragraph 1 above, my profile shall either be (a) permanently deleted, or (b) transferred to a secure archive restricted for cold cases, appeals and judicial reviews (delete as appropriate).
- e. Should the Staff/Manufacturers (select as appropriate) Elimination Database cease to operate, then my DNA profile should be (a) transferred to another approved elimination database/authorised archive, or (b) removed and destroyed (select as appropriate), and I will be notified of this in writing.

Donor (name) \_\_\_\_\_ Witness (name) \_\_\_\_\_

(The witness is anyone confirming the continuity of the sample taken against the details of the individual, this is usually someone involved in the sample collection or work.)

Signature \_\_\_\_\_ Signature \_\_\_\_\_

Date \_\_\_\_\_ Date \_\_\_\_\_

## **24. Review**

- 24.1.1 This published document will form part of the review cycle as determined by the Forensic Science Regulator.
- 24.1.2 The Forensic Science Regulator welcomes views on this guidance. Please send any comments to the address as set out at the following web page: [www.gov.uk/government/organisations/forensic-science-regulator](http://www.gov.uk/government/organisations/forensic-science-regulator) or send them to the following email address: [FSREnquiries@homeoffice.gsi.gov.uk](mailto:FSREnquiries@homeoffice.gsi.gov.uk) .

## **25. Acknowledgements**

- 25.1.1 The Forensic Science Regulator acknowledges the invaluable assistance of the following in the preparation of this document:
- a. Dr Timothy Clayton;
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  - e. Home Office Forensic Science Regulation Unit;
  - f. Key Forensics;
  - g. LGC Forensics;
  - h. Forensic Information Databases Service (FINDS);
  - i. Orchid Cellmark Forensic Services;
  - j. Scottish Police Authority.

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## 27. Abbreviations and Acronyms

Abbreviation	Meaning
BS	British Standard
CDD	Contamination DNA Database
CED	Contamination Elimination Database
CJS	criminal justice system
CODIS	Combined DNA Index System: the USA national DNA Database
DNA	Deoxyribonucleic Acid
EN	European Standards



<b>Abbreviation</b>	<b>Meaning</b>
ESS	European Standard Set of Loci
FINDS	Forensic Information Databases Service
FSP	forensic science provider
IEC	International Electrotechnical Commission
ISO	International Organisation for Standardization
<b>SED</b>	Staff Elimination Database (laboratory)
MED	Manufacturers Elimination Database
NDNAD	National DNA Database®
PACE	Police and Criminal Evidence Act 1984
PAS	publicly available specification
PCR	polymerase chain reaction
PED	Police Elimination Database
STR	short tandem repeat

## 28. Glossary

### **DNA contamination:**

The introduction of DNA, or biological material containing DNA, to an exhibit or subsample derived from an exhibit during or after its recovery from the scene or a person.

### **(Data) Controller:**

A person who (either alone or jointly or in common with other persons) determines the purposes for which and the manner in which any personal data are, or are to be, processed.

### **(Data) Processor:**

Any person (other than an employee of the 'controller') who processes the personal data on behalf of the controller.

**DNA-17 System:**

Short tandem repeat (STR) multiplex system (kit) with 17 STR loci (including the gender marker amelogenin).

**DNA-sensitive area:**

Area in which appropriate DNA contamination prevention measures shall be maintained at all times. Also referred to as DNA clean areas.

**Elimination database:**

Collection of DNA profiles held in a searchable format from staff whose access/role/activities are deemed to be a potential DNA contamination risk. The profiles are used to identify instances of inadvertent contamination.

**Forensic DNA Grade:**

Consumables that are compliant with the requirements set out in ISO 18385:2016 Minimizing the risk of human DNA contamination in products used to collect, store and analyse biological material for forensic purposes.

**Forensic science provider:**

Organisation that undertakes any part of the DNA sample recovery and analytical process on behalf of the police or other criminal justice system customers, police evidence recovery labs are also included.

**Human DNA-free:**

Human DNA is not detectable by the most sensitive DNA profiling techniques currently in use.

**Partial profile:**

An incomplete profile obtained from the profiling system used.

**Police and Criminal Evidence Act 1984 samples (PACE):**

Reference DNA samples taken under the provisions of the Police and Criminal Evidence Act 1984 (PACE) and accompanying codes of practice, that provide the core framework of police powers and safeguards around stop and search, arrest, detention, investigation, identification and interviewing detainees.

**The Prüm Treaty:**

The Prüm Treaty is an international police co-operation agreement signed by Austria, Belgium, France, Germany, Luxembourg, the Netherlands and Spain on 27 May 2005, which has now become part of the legislative framework of the EU. The agreement involves police co-operation and information exchange on DNA profiles, fingerprints and vehicle number-plates.

**Reference sample:**

A biological sample obtained from a known person with the purpose of creating a DNA profile for comparison.

**Un sourced contaminant:**

A DNA profile identified as a contaminant i.e. following all relevant elimination database checks of which the source has not been identified. No template (negative) controls and quality control batch tests are considered as having originated from the manufacturing supply chain.

**29. Further Reading**

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