



Forensic Science Regulator Guidance

**The Control and Avoidance of Contamination in
Scene Examination involving DNA Evidence
Recovery**

FSR-G-206

Issue 2

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1. Introduction

- 1.1.1 For the purposes of this guidance, contamination is defined as ‘the introduction of DNA, or biological material containing DNA, to an exhibit at or after the point when a controlled forensic process starts’. This is distinct from the adventitious transfer of biological material to an exhibit that can also occur, usually prior to the exhibit or sample being recovered and before investigative agencies have intervened, this is often referred to as ‘background DNA’.
- 1.1.2 These guidelines for good practice are necessary because DNA techniques in routine use can readily generate profiles from DNA found in minute saliva aerosols or in skin cells deposited on handled items.
- 1.1.3 From a forensic science perspective, **incident** investigation activities can be considered as two distinct phases.
- a. Scene investigation (scene/victim/suspect), during which investigative agencies are involved in locating, recording, recovering, packaging, storing and transporting exhibits.
 - b. The analytical phase in which the recovered exhibit is processed within a laboratory.
- 1.1.4 Contamination can occur at any point in these investigation phases. **Potential** routes for DNA contamination to occur **include**:
- a. From personnel to the exhibit/DNA sample;
 - b. From examiner to gloves to exhibit/DNA sample;
 - c. From contaminated consumables (for example, swabs, tubes, personal protective equipment [PPE]/ barrier clothing **and packaging materials of the aforementioned**) to the exhibit/DNA sample; and
 - d. From exhibit to exhibit or DNA sample to DNA sample.
- 1.1.5 Contamination may occur as follows:
- a. Directly, also described as ‘primary transfer’, for example, saliva or dandruff from an examiner onto an exhibit.
 - b. Indirectly, also described as ‘secondary transfer’ or tertiary transfer for multiple step transfers of a single source, **for example, from one scene to**

another via contaminated equipment (such as cameras, tripods, step plates) not properly cleaned from previous scenes.

1.1.6 Contamination may be:

- a. Sporadic, that is resulting from an incident affecting just one DNA sample from a number in a batch; or
- b. Systemic, resulting from an event that affects a whole batch or series of DNA samples at the same time.

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

- a. Reduction in the risk of contamination as far as is practicable, for example, by:
 - i. Minimising the chance of contamination occurring by, for example, staff using barrier clothing;
 - ii. Restricting access to areas containing exhibits;
 - iii. Cleaning scene examination equipment and surfaces before and after use;
 - iv. Rendering consumables free from detectable levels of DNA; and
 - v. Ensuring that equipment used at scenes is adequately decontaminated between scenes based on risk assessment.
- b. Detection of contamination primarily involves:
 - 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. Comparison of DNA profiles generated from items to results detected from quality assurance (QA) testing of reagents and consumables and from laboratory controls;
 - iii. Cross-checking of profiles within the same batch of samples and from different batches of samples processed within the same laboratory;
 - iv. Investigation of unexpected results; and
 - v. The incorporation of appropriate controls into the forensic process.

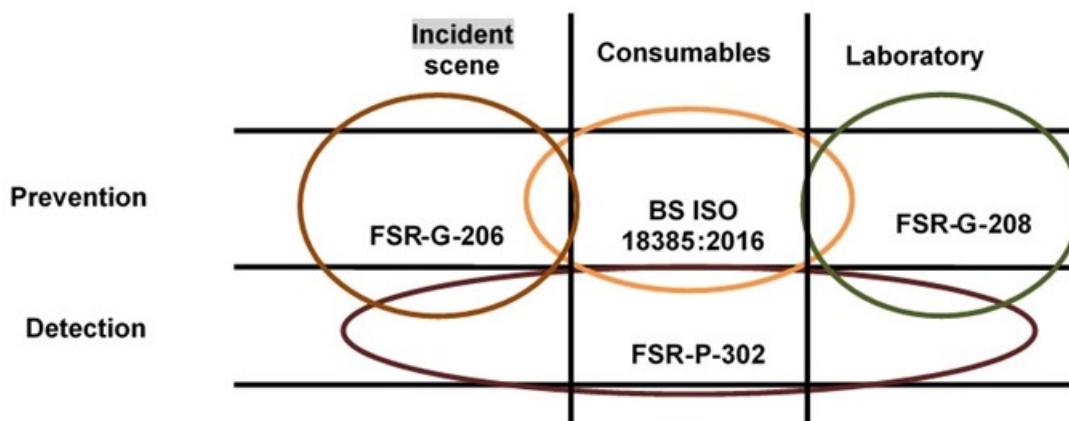
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- 1.1.8 It is recognised that DNA contamination incidents cannot be eliminated completely, given the prevalence of human DNA within the living and working environment. This issue is exacerbated by the increasing sensitivity of DNA analytical techniques.
- 1.1.9 Nothing can be done to reduce background DNA at scenes, but it is essential that everyone in the investigative process:
- a. Is aware of the importance of maintaining the integrity of evidence;
 - b. Takes appropriate steps to minimise the risks posed by the inadvertent addition or the transfer of DNA during scene examination or other stages of the forensic analysis process; and
 - c. Is aware of the option to take 'background' samples where appropriate.
- 1.1.10 Therefore, an effective DNA anti-contamination process requires a combination of approaches both to minimise the opportunity and therefore the risk of occurrence and maximise the ability to detect contamination when it does occur. One study identified that of 327 crime scene workers sampled, 46 (14%) of them had contaminated at least one crime scene sample when comparisons were made to current casework profiles and 31,071 loaded crime stain profiles (Lapointe et al., 2015). Whilst it seems reasonable to argue that DNA contamination events are not an everyday occurrence, given these data, every effort should be made to reduce their occurrence. . As of August 2020, 1,445 crime scene DNA profiles were removed from the National DNA Database® following contamination elimination database (CED) checks where the source of the DNA profile was concluded to be contamination from Force or other DNA supply chain staff activities.
- 1.1.11 The purpose of this document is to provide guidance on how to control and avoid the incidence of DNA contamination during scene examination, including the searching for, recording and recovery of items, their packaging, transportation and storage prior to submission for forensic examination.
- 1.1.12 This guidance should be read in conjunction with:
- a. Forensic Science Regulator Codes of Practice and Conduct;

- b. FSR-P-302:DNA contamination detection- The management and use of staff elimination databases;
- c. BS ISO 18385:2016 ‘Minimizing the risk of human DNA contamination in products used to collect, store and analyse biological material for forensic purposes’; and
- d. FSR-G-208 ‘The control and avoidance of contamination in laboratory activities involving DNA evidence recovery and analysis’.

1.1.13 The interaction of the Forensic Science Regulator’s (FSR’s) anti-contamination guides together with the DNA consumable standard BS ISO 18385:2016 is shown in Figure 1.

Figure 1. Interaction of anti-contamination guidelines



2. Scope

2.1.1 The scope of the Codes of Practice and Conduct for Forensic Science for Providers and Practitioners in the Criminal Justice System (the Codes) (Forensic Science Regulator), encompasses initial forensic science activity at scenes, which includes the following:

- a. The scene examination strategy.
- b. The searching for, recording, recovery, preservation, transport and storage of, exhibits.
- c. Screening tests for use in the field.

2.1.2 This guidance does not apply to targeted forensic evidence recovery in proactive investigations, where safety or security requirements may preclude

the use of anti-contamination measures. Such activity should be the subject of a separate protocol, including the communication of contamination issues that need to be considered when analysing DNA results.

- 2.1.3 ISO/IEC 17020:2012 'Conformity assessment – Requirements for the operation of various types of bodies performing inspection' is the international quality standard required for scene work.
- 2.1.4 Guidance on the application of this standard to scene examination is provided by both the UK Accreditation Service (UKAS) in the document RG201 'Accreditation of Bodies Carrying out Scene of Crime Examination' and the International Laboratory Accreditation Cooperation (ILAC) in the document ILAC G19:08 'Modules in a Forensic Science Process'. These provide high level requirements with regard to anti-contamination measures including:
- a. Demonstrating that reagents and kits used at scenes are fit for purpose;
 - b. A risk assessment of issues surrounding the potential for cross-contamination between samples; and
 - c. An assessment of each individual scene to ensure that suitable anti-contamination measures are in place.
- 2.1.5 Whilst there is considerable guidance available on scene operating policies and procedures, relatively few publications specifically address DNA contamination issues and the most informative of these are included in the Bibliography (section 16). At the time of publishing, this guidance collates the latest thinking on DNA anti-contamination measures and correlates this against the relevant sections of the ISO/IEC 17020 standard to assist in accreditation assessment of scene investigator activities against this standard.
- 2.1.6 This guide provides requirements and guidance regarding anti-contamination measures to be taken at scenes. These include:
- a. Anti-contamination strategy;
 - b. Anti-contamination risk assessment
 - c. Personnel;
 - d. Equipment and consumables;
 - e. Scene activities and procedures;

- f. Drying cabinets and temporary storage of items; and
- g. Contamination detection measures.

2.1.7 Within the scope of this document is the use of drying cabinets, given that these may be used as an interim processing stage prior to the submission of items to a laboratory for assessment and analysis. Outside of the scope is the recovery of evidence and taking of reference samples from either victims or arrestees; these will be covered in a separate guidance document.

2.1.8 This appendix applies to England and Wales. Scotland and Northern Ireland should also institute parallel arrangements for their jurisdictions.

3. Implementation

3.1.1 This guidance is available for incorporation into an organisation's standard operating procedures and quality management system from the date of publication. The Regulator required that requirements set out in this guidance came into effect from October 2018. These are ongoing requirements and changes should be implemented three months from publication of any revised document.

4. Modification

4.1.1 This is the second issue of this document. Parts of this document which have been significantly altered from the previous issue are highlighted in grey and are listed at 4.1.2. 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.

4.1.2 The following paragraphs contain substantive changes from the previous issue of this document: Copyright; 1.1.3,4,5,7,9,10,12; 2.1,4,5,6; 3; 4; 5.1.3; 6(heading); 6.1.1,6,7,9,13,17,19,21,25; 6.2.2; 7(heading); 7.1.2,3,4,5,6,8,11; 8(heading); 8.2.2.3.4.6.7; 8.3(heading); 8.3.4,6,7,8; 8.4.2; 8.5.1,2,3; 9.1.1,2; 10.1.5; 10.2.2,3; 10.4.5,6; 10.5.1; 10.7.9; 10.8.2; 11(heading); 11.1.2,5,6; 12.1.1,2; 13.1.1; 15; 16; 17; 18.

4.1.3 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

'#' 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-G-206. Combined with the issue number this ensures each document is uniquely identified.

4.1.4 If it is necessary to publish a modified version of a document (e.g. a version in a different language), then the modified version will have an additional letter at the end of the unique identifier. The identifier thus becoming FSR-#-####.

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

5. Terms and Definitions

5.1.1 The terms and definitions set out in the following documents also apply to this guidance.

- a. Codes of Practice and Conduct for Forensic Science Providers and Practitioners in the Criminal Justice System (the Codes) (Forensic Science Regulator).
- b. DNA Analysis, FSR-C-108 (Forensic Science Regulator).
- c. DNA contamination detection: The management and use of staff elimination DNA databases, FSR-P-302 (Forensic Science Regulator).

5.1.2 The word 'shall' has been used in this document where there is a corresponding requirement in ISO/IEC 17020 or the Forensic Science Regulator's Codes; the word 'should' has been used to indicate generally accepted practice and the word 'may' has been used for recommendations. Recommendations have been used to indicate what ideal practice is when it is practicable.

5.1.3 The term 'forensic unit' (FU) refers to all providers of forensic science, whether commercial, public sector or internal to a police service. FUs can be small teams in larger organisations, sole practitioners or large providers and can be instructed by the prosecution or the defence.

6. Anti-Contamination Strategy

ISO/IEC 17020 sec. 7.1.2, 7.1.6; RG201 sec. 7.1.2 and 7.1.6

6.1 Scene anti-contamination strategy

- 6.1.1 At scenes the risk of contamination shall be minimised as far as is practically possible. A key element of this, especially for serious and major incidents, i.e. where a scene manager or equivalent is deployed, is to manage activities both within and outside the scene and at other relevant locations in a strategic and coherent fashion to ensure that contamination risks are understood and mitigated as far as practically possible.
- 6.1.2 This applies not just to a particular scene or secondary scene, but across a case or linked cases, addresses and vehicles.
- 6.1.3 The anti-contamination strategy should not cover health and safety risk assessments in a scene; these are separate issues.
- 6.1.4 For each serious and major scene an overall and fully documented forensic strategy is required. The anti-contamination strategy is a component of this and shall:
- a. Be tailored around the known circumstances of the investigation;
 - b. Commence at the earliest practicable opportunity following the first receipt of case-specific information;
 - c. Be subject to continual review and modification as the investigation develops; and
 - d. Be properly documented and effectively communicated to all relevant staff.
- 6.1.5 Factors that shall be considered and written into the anti-contamination strategy include the following:
- a. Prior to scene attendance.
 - b. Environmental factors.
 - c. Staff deployment.
 - d. Cordons and scene protection.
 - e. Scene assessment.

- f. Contamination risks between different parts of the same scene.
- g. Use of dogs.
- h. Handovers.
- i. Release of a scene.

Prior to scene attendance

6.1.6 A record shall be made of the communications received, the preparation, cleaning (in accordance with risk assessment) and maintenance of equipment used, legitimate access and communal areas used. Where relevant, a record of persons with legitimate access to the scene and their activities before and during control was established.

Environmental factors

6.1.7 Environmental factors include the following.

- a. Hot conditions that introduce a higher risk of contamination (for example, scenes where extreme heat introduces the risk of contamination due to perspiration whilst undertaking searching, recording and recovery activities). In this example the anti-contamination strategy could include the provision of lighter more breathable scene suits, wearing lighter clothing underneath the scene suits and regular breaks arranged at the beginning of the scene attendance.
- b. The linking of environments, for example, through communal corridors, waterways or streets. In this example the strategy could include identifying a route(s) to minimise contaminating the primary scene or appropriate protective clothing changes required.

Staff deployment

6.1.8 Avoidance of utilising the same personnel, vehicles or equipment that have:

- a. Attended a scene related to the same offence;
- b. Attended a linked scene or incident; or
- c. Been involved in the laboratory examination of items recovered from the same case.

- 6.1.9 Where operational imperatives dictate that utilising the same staff cannot be avoided, due consideration before deployment shall be given to:
- a. The risks and possible transfer mechanisms for material to pass from one scene to another and how these can be mitigated (such as the use of different vehicles and equipment) to provide support to examination at different scenes associated with the same **incident** or a linked **incident**; and
 - b. Showering and a change of clothes for practitioners; and
 - c. Ensuring adherence to strict cleaning and decontamination measures for equipment between scenes.
- 6.1.10 Due consideration should also be given to the proximity of scenes with interrelated cross-contamination risks. In addition, consideration should be given to the risks associated with investigators returning to the same scene or sharing pool vehicles between scenes.

Cordons and scene protection

- 6.1.11 Cordons shall be sufficient and positioned appropriately as soon as it is safe to do so. They should include all known or possible routes to and from the location of the incident by all individuals involved as a key anti-contamination measure.
- 6.1.12 Control and maintenance of the cordon and attendee record, i.e. a scene log, shall be undertaken by persons who are trained and competent in this role.
- 6.1.13 The scene cordon and scene log shall be assessed by the first attending scene investigator /scene of crime officer and amended if evidence or forensic opportunities are in imminent risk of loss or contamination. Appropriateness shall also be checked by the **scene manager** or equivalent.
- 6.1.14 Access to the scene should be controlled as a single point of entry. Wherever possible a route from the cordon boundary to the location of the incident should not knowingly be used by any individuals involved in the incident, i.e. a common approach path is established. Exceptionally, two entry points may be more appropriate if this enables staff to avoid passing from one delineated zone to another.

- 6.1.15 Personnel required to attend the scene subsequently to assist in the examination should be directed to park their vehicles in a suitable designated area (rendezvous point) outside the cordon but as near to the head of the common approach path as possible. This will minimise potential contamination risks during the transport of items to and from the scene.
- 6.1.16 Utilising scene entry tents is an example of good scene management. These can be separated into different areas for putting PPE / barrier clothing on and taking it off, as well as for packaging and disposing of used PPE/ barrier clothing.
- 6.1.17 **Good practice at scenes is** to ensure that the minimum number of people required to undertake the effective examination of the scene are admitted.

Scene assessment

- 6.1.18 In the initial assessment of the scene appropriate precautions shall be taken to preserve evidence on floors, for example, by using stepping plates or identifying, clearing and marking a common approach path through the scene.
- 6.1.19 This shall identify what parts of the scene are under protection and the anti-contamination measures required within these including:
- a. Parts where PPE / barrier clothing shall be worn;
 - b. Parts where PPE/ barrier clothing shall not be worn (for example, where overshoes must be removed);
 - c. Protection of ground surfaces including where stepping plates are to be deployed;
 - d. **Protection of packaging and consumables;** and
 - e. Designated areas for disposal of waste such as used PPE/ barrier clothing.
- 6.1.20 Where an exhibit is assessed to be too great a biohazard to be handled, transported and/or stored, relevant professionals should be deployed to deal with it in accordance with health and safety regulations.

Contamination risks between different parts of the same scene

- 6.1.21 Inadvertent movement of material from one part of a scene to another constitutes a contamination risk. For example, communal living areas or shared/public areas within scenes or where rooms within a scene have been ascribed particular significance by witnesses. Under these circumstances, additional measures to avoid cross-contamination shall be considered:
- a. Control of entry to and exit from specific areas within the scene.
 - b. Early examination, recording and recovery of DNA (visible and non-visible) from frequently handled items for example, door handles.
 - c. Examination of different rooms on different days or by different personnel.
 - d. **Cleaning or changing gloves and** changing **other** barrier clothing and/or other equipment between different parts of the same scene.

Use of dogs

- 6.1.22 Where the use of dogs for locating body fluids within a scene is being considered, the risks of contamination shall be assessed along with the feasibility of utilising less contamination-prone alternatives.
- 6.1.23 Dogs may introduce DNA from outside the scene including:
- a. From individuals who have handled the dogs;
 - b. Transferring material from one part of a scene to another;
 - c. Transferring material out of the scene; and
 - d. Potentially compromising the capability of obtaining DNA results by contaminating items with their own oral mucus, which strongly inhibits the DNA amplification polymerase chain reaction (PCR).
- 6.1.24 It is recognised, however, that for certain scenarios such as searching large woodland areas, there may be no viable alternative to canine searches. Where this is the case the sequence of activities should be included in the case strategy and notes taken regarding where and when the dogs were used together with a note of the contamination risks.

Handovers

- 6.1.25 During the handover of responsibilities to new staff, briefing shall be provided on the anti-contamination strategy and anti-contamination measures, and a record should be made of this.

6.2 Contamination strategy across a case

- 6.2.1 Throughout the duration of an investigation specific notes should be made of each scene including:
- a. Dates and times of examinations;
 - b. All the anti-contamination measures implemented and reasons for these, including measures to minimise the risk of specific identified contamination risks;
 - c. The personnel deployed and for what purpose;
 - d. For extended or complex investigations, consideration should be given to the completion of a 'contamination matrix' to assist in identifying any potential contamination incident(s). These provide the basis on which to assess contamination risk and to formulate and manage the case anti-contamination strategy.
- 6.2.2 Amendments to strategy at handover should be recorded.

7. Personnel

ISO/IEC 17020 sec. 6.1.3 and Codes sec.18.1,18.3, and 19

- 7.1.1 Scene management goes through two phases: stabilisation followed by control. During the stabilisation phase the primary objectives are to make the location safe and to preserve life.
- 7.1.2 Emergency service personnel who attend scenes should have some forensic awareness with regard to DNA anti-contamination measures required without impacting on their primary roles for scene attendance. This includes paramedics and fire service staff who may attend during the stabilisation phase. Once the scene is controlled this may include, for example, forensic scientists, exhibits

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officers, CID officers, forensic pathologists, police search advisers, licensed search officers and staff from forensic science providers (FSPs).

- 7.1.3 The first attending officer shall be trained, competent and equipped to undertake the role of **preserving the scene** prior to attendance of a professional forensic practitioner who will take over as **scene manager** or equivalent.
- 7.1.4 When control of the scene has been achieved, the **scene manager** shall record the known and stated activity of individuals involved pre and post incident, including emergency service personnel, members of the public and possible suspects known to have been within the cordoned off area. This information shall include where they have been, what they have touched, moved, taken away and left behind. These activities shall be taken into account for the anti-contamination strategy.
- 7.1.5 The **scene manager** shall also consider, record and request for seizure, relevant samples, clothing and footwear and control samples (fingerprints and DNA) from emergency service personnel, members of the public and possible suspects.
- 7.1.6 **Scene examiners** attending the scene are trained in and, through assessment, **demonstrate** knowledge of:
- a. Contamination issues including contamination theory and understanding the mechanics of contamination, the rationale behind anti-contamination measures and practical knowledge of any anti-contamination-related standard operating procedures (SOPs) employed at scenes to avoid contamination;
 - b. Issues relating to contamination risks and their avoidance in specific processes and methods. These shall be an integral part of staff training documentation, and the relevant issues shall be included within training plans and manuals.
- 7.1.7 This guidance appendix to the Codes (Forensic Science Regulator) shall be introduced to all scene-going investigators.
- 7.1.8 All staff attending a scene once it is controlled shall be made fully aware of the risks specific to the scene and how they are to be mitigated. It is the

responsibility of the **scene manager** or equivalent to ensure that all individuals attending the scene are aware of, and conform to, the anti-contamination measures specific to the scene in question as defined in the scene anti-contamination strategy.

7.1.9 Anyone suffering from a short-term medical condition that causes the shedding of body fluids or particles (for example, colds, coughs, influenza, hay fever or elevated temperature promoting sweating) should be actively discouraged from attending the scene. There is also an increased risk of contamination from individuals who are naturally heavy shedders or have certain skin conditions. This increased risk may be acceptable provided that it is effectively managed by the use of appropriate PPE/ barrier clothing and adherence to anti-contamination procedures, and that the DNA profile of the affected individual is available for searching against the relevant elimination database (see 7.1.11 and 11.1.5).

7.1.10 All staff called to a scene specifically for examination purposes (searching, recording and recovery) shall ensure that they have sufficient equipment to undertake their duties. This includes equipment needed for taking effective anti-contamination measures and for health and safety requirements. This equipment includes:

- a. Sufficient PPE/ barrier clothing;
- b. Sufficient consumables including recovery and packaging equipment;
- c. Sufficient cleaning materials; and
- d. Equipment that has been effectively cleaned since the last deployment to a scene.

7.1.11 All staff working in the forensic process **should** have had a DNA sample taken from them for submission to the relevant staff elimination database. With some **forensic units (FU)** this will be a mandatory requirement, for others the absence of such a sample should be recorded (see section 11).

8. Equipment and Consumables

ISO/IEC 17020:2012, sec.6.2 and the Codes sec. 13 and 24

8.1 Receipt, handling and storage

- 8.1.1 Steps shall be taken to ensure that appropriate precautions are taken to minimise the contamination of consumables prior to use.
- 8.1.2 As a minimum this includes secure storage, restricted access, steps to minimise the chance that the handler (Fonneløp et al, 2016) causes inadvertent DNA contamination and the risk of DNA being transferred from adjacent items or the storage environment.
- 8.1.3 Any sample packaging and/or collection kits used shall be fit for purpose. This can be demonstrated by consumable manufacturers and kit assemblers meeting the requirements set out in ISO 18385:2016 and for other non-DNA consumables, set out in the Publicly Available Specification (PAS) 377:2012.
- 8.1.4 Areas used for the storage and handling of consumables, samples and exhibits shall be secure and access restricted to authorised personnel only (the Codes 23.3).

8.2 Personal protective equipment (PPE)/barrier clothing

- 8.2.1 PPE/ barrier clothing serves a double purpose:
 - a. To protect the wearer from contact with hazardous materials; and
 - b. To protect exhibits from contamination by the wearer.
- 8.2.2 For serious incidents, PPE/ barrier clothing for entering the scene shall consist of the following.
 - a. Face mask (and beard snood on top of mask if required), which shall be a pinch-nose barrier type mask that is effective at preventing DNA transfer. Other masks may need to be used for other purposes (for example, health and safety). This should be recorded. The wearer shall keep talking to a minimum whilst sampling, or when recovering samples,

or when in close proximity to possible sources of DNA evidence. The wearer shall also avoid adjusting or otherwise manipulating the face mask (or glasses if worn) whilst at the scene. Where this cannot be avoided, the outer gloves should be cleaned or replaced immediately.

- b. Mob cap/hairnet: A mob cap or hairnet, or the hood of the scene suit shall be worn at all times in the scene to prevent shed hair or skin flake contamination by the examiner.
- a. Gloves: Two pairs shall be worn at all times when handling exhibits that will require analysis. These shall be disposable and powder free nitrile gloves. The powder in gloves has been found to inhibit subsequent DNA analysis and can potentially contaminate items being handled, therefore powdered gloves should be avoided. Exposure of skin or clothing shall be avoided by for example:
 - i. Taping the inner pair to the scene suit; or
 - ii. Inserting the thumb through a hole in the cuff to prevent the suit sleeve from rucking up and always wearing gloves over the top; or
 - iii. Wearing 'long cuff' gloves as the 'inner' pair so that the cuff can be stretched over the sleeves of the scene suit.
- b. Over-suit: This shall be worn, including the hood or mob cap, at the scene. It shall not be modified by making holes or openings in the suit that expose skin or clothing (see exception c.ii above), or be otherwise handled unnecessarily at the scene.
- c. Overshoes: These should be worn at all times within the scene unless otherwise directed by the scene manager or equivalent. Exposure of skin or clothing between the scene suit and overshoes should be avoided, if necessary by taping them together.

8.2.3 The outer gloves shall be changed or cleaned regularly, ideally at a designated place away from the area being examined, both before and after handling individual items that may be submitted for DNA analysis.

8.2.4 If any of the PPE / barrier clothing becomes visibly stained or compromised they shall be changed.

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- 8.2.5 If any item(s) of PPE/ barrier clothing is believed to have become a potential source of contamination this possibility shall be recorded in the examination notes and the specific item(s) of PPE / barrier clothing seized as exhibits.
- 8.2.6 The order of putting on PPE /barrier clothing shall be as follows:
- a. Face mask (and beard snood, where required) should be put on before any other protective clothing to avoid the latter from being contaminated with saliva aerosols, followed by;
 - b. Mob cap (and hard hat, if required);
 - c. Safety glasses
 - d. First pair of gloves;
 - e. Over-suit;
 - f. Overshoes; and finally
 - g. Second pair of gloves.
- 8.2.7 For volume incident scenes, at the point of recovery of DNA a face mask and double gloves shall be worn.
- 8.2.8 The wearing of gloves and face masks when searching and recovering evidence at all scenes regardless of their seriousness is essential, as most contamination occurs by:
- a. Handling items without gloves or where the gloves are torn; or
 - b. Talking, sneezing or coughing over the items.
- 8.2.9 Due consideration should also be given to wearing additional or alternative PPE / barrier clothing depending on the specific health and safety requirements of each scene.
- 8.2.10 All PPE / barrier clothing including overshoes should be removed at the designated exit point when exiting a scene and placed in a bag. This shall be sealed either for appropriate disposal or retention (see 11.1.2).

8.3 Consumables including disposable equipment

ISO/IEC 17020 Equipment sec. 6.2.2/6.2.3 or Process Requirement sec. 7.1.1/7.1.2 and the Codes sec.13

- 8.3.1 Consumables are single-use commodities used in the collection, preservation and processing of material for forensic analysis, and are bought and used up recurrently. These include PPE/ barrier clothing, tamper evident containers, swabs and packaging that come into direct contact with the material for forensic analysis. A consumable can also be equipment used in the collection, processing and safe handling of the material, for example, disposable tweezers and scissors.
- 8.3.2 Wherever possible, consumables including disposable equipment that will come into direct contact with the evidential material intended for DNA analysis shall be quality assured to be free from detectable human DNA or forensic DNA grade.
- 8.3.3 Assurance can be provided by the consumables being independently assessed as compliant with ISO 18385:2016 or through quality control (QC) testing of batches of reagents and consumables, verified by the generation and documentation of data, as being fit for purpose when using the most sensitive DNA tests.
- 8.3.4 The requirements for consumables including the batch testing requirements can be found in FSR-C-108 'DNA Analysis' section 10.
- 8.3.5 Ideally consumables/items should be individually sealed or provided as a self-contained kit comprising a set of all the required items for a specific activity. Where these are not available all reasonable efforts should be made in the storage, transport and handling of multiple packs of consumables to minimise the risk of cross-contamination post-receipt from the supplier. For example, a box of disposable nitrile gloves should be dedicated solely for use as outer gloves and should be kept in a re-sealable bag that is only opened when wearing a pair of under-gloves.

Risk assessment

8.3.6 A risk-based approach should be considered by FUs when assessing the use of consumables for scene applications. This should consider the risk associated with using the consumable as an integral part of the overall process and within the specific context of each step of this process.

8.3.7 Table A in the annex provides some examples of how this assessment can be undertaken by breaking the process down into individual steps and considering risks of contamination within each of these. For each identified risk the potential impact is considered if the risk becomes a reality and each is given an overall risk rating by multiplying the potential impact by the likelihood of it occurring by the ability of detection. Each is estimated on a scale of 1-10 in increasing severity.

8.3.8 Table B in the annex provides an example of a rating system developed by the scene investigation expert network. Actions are then identified to reduce or mitigate the risk and the residual risk rating post-action is then calculated. The rating system provides a means to prioritise addressing the identified risks. This type of exercise identifies that use of contaminated consumables poses a significant risk of misleading investigations and missed identification of the offender but various actions can be taken to reduce or mitigate this risk, as discussed in the following examples:

- a. The risk of using a collection device that has been contaminated during manufacture (Risk 8 in the table A) has a high calculated risk rating. This is mitigated by, amongst other measures, using forensic DNA grade consumables manufactured in compliance with ISO 18385: this both minimises the risk of contamination through post-manufacture DNA dosage reduction and maximises the likelihood of detection through checks against an elimination database of manufacturing staff.
- b. The risk of contamination of the collection devices by scene practitioners (Risk 9 in the table A) also has a high calculated risk rating. This is mitigated by ensuring that SOPs and associated training and competency assessment are in place for anti-contamination procedures including glove cleaning were required. This minimises the risk of contamination occurring,

reinforced by ensuring that the DNA profiles of all scene examiners are held in an elimination database to ensure that detection is maximised in the event of contamination occurring.

8.4 Packaging

8.4.1 The packaging of collected material shall preserve the integrity of the potential material for forensic examination and minimise the risk of loss, degradation or contamination.

8.4.2 As a minimum this should include:

- a. Separate packaging of items where the packaging of items together is likely to compromise them;
- b. The appropriate packaging for the size, condition and forensic analysis requirements of the material recovered;
- c. Secure sealing; and
- d. Appropriate labelling

8.5 Non-disposable equipment

8.5.1 Equipment that is to be re-used at different scenes and that may have come into direct contact with items being recovered for subsequent DNA analysis should be effectively cleaned prior to re-use. Based on a risk assessment, this might include, for example:

- a. Equipment and kits to undertake examination of the scene;
- b. Lighting equipment;
- c. Stepping plates for the preservation of surfaces; and
- d. Pens, rulers and scales

8.5.2 For major incident scenes ideally a new fingerprint brush/powder is used if DNA recovery has not been completed prior to use. For volume incident scenes, sequential processing should be undertaken to minimise cross-contamination, together with periodic replacement in particular when there is any possibility that a contaminated surface may have been brushed

8.5.3 Equipment shall be cleaned and used according to documented standard operating procedures (SOPs) demonstrated to be effective at removing DNA. A

cleaning log should also be kept, which provides traceability to the equipment cleaned.

9. Scene Activities and Procedures

9.1.1 All activities within the scene, including any cleaning and/or storage area deployed should be controlled by a suitably trained individual who has gained competence in the understanding of the mechanisms of contamination, assessment of risk and minimising risk whilst promoting detection. Typically this is by a scene manager or equivalent for major incidents, whilst for less serious incidents compliance with anti-contamination procedures may be the responsibility of another nominated individual such as a forensic practitioner or the scene investigator in attendance.

9.1.2 Where the controlling individual requires additional input from suitably qualified sources in relation to anti-contamination measures this input shall be documented.

- a. Access to the scene should be restricted as far as is practicable to those personnel who need access for a specific reason.
- b. Movement within the scene should be kept to the minimum possible for the work that has to be undertaken.
- c. Verbal communication around areas of interest within the scene should be kept to a minimum despite the fact that masks are being worn.
- d. The touching of spectacles, face, telephones, door handles, light switches, pens, paper, rulers, etc., without subsequently changing or cleaning the outer pair of gloves should be avoided.
- e. The use of mobile phones and radios should be minimised within the scene and, if used, appropriate anti-contamination procedures carried out.
- f. Items from which samples are taken should be handled carefully and as little as possible, and packaged at the earliest opportunity.
- g. All items seized shall be packaged, sealed and labelled at the time they are taken, and wherever possible the packaging should be taken to the item and not the item to the packaging.

- h. Measures should be put in place to prevent/minimise contamination of equipment and consumables brought into the scene, for example, setting up a clean area within the scene for equipment to be placed if required.
- i. Packaging and other containers should be of an appropriate size for the items being packaged so that the item does not become damaged, and the packaging does not become compromised during transportation and storage.
- j. Due care and consideration should be made when deciding whether to package items separately or whether to combine them (for example, cigarettes).

10. Drying Cabinets and Temporary Storage of Items

10.1 Introduction

- 10.1.1 Consideration shall be given to preserving DNA from degradation for items recovered that are wet; should freezing not be a suitable option (for example, wet clothing) then items shall be dried in a controlled environment.
- 10.1.2 If practicable, recovered items for DNA laboratory examination should be transported to the laboratory without delay. Where this is not practicable, for example, where exhibits' reviews are required or items are not required for immediate submission, the risk of degradation of evidence should be assessed. Actions should be taken to minimise the loss of evidence, for example, drying or prioritisation of the examination of higher risk items.
- 10.1.3 All items shall be stored in such a manner that they cannot be cross-contaminated, tampered with or stolen, and so that only authorised personnel have access to them. This is essential in order to ensure that the integrity of the evidence cannot be compromised and that the chain of custody can be demonstrated and therefore does not provide the basis for any subsequent challenge.
- 10.1.4 Samples that are obviously stained with body fluids such as blood should be dried separately from less obviously stained items to prevent contamination by transfer of dried flakes, etc. Items considered for sensitive DNA tests should be

dried separately, unless recovered co- mingled from the same owner and separation would compromise other material of interest.

- 10.1.5 Short-term storage conditions should be in accord with the FU's standard operational procedures (SOPs), which specify best practice for each type of evidence. Where the circumstances of the case dictate, wet or damp items should ideally be dried to preserve DNA prior to forensic examination. Where it is not possible to commence drying the item immediately on receipt, it shall be adequately packaged to preserve the distribution evidence, for example, by folding it into a piece of brown paper then immediately freezing it in a polythene bag to minimise degradation.
- 10.1.6 Regardless of where they are located, drying rooms or cabinets used to dry recovered items should conform to the same general requirements as any other room or equipment used for accreditation to ISO/IEC17025 for body fluid searching and examination, as outlined in FSR-G-208. This requirement has been stipulated by the Forensic Science Regulator because drying necessitates opening the packaging and therefore should only be undertaken in a controlled environment. An exception is where a wet item has been packaged in a breathable polymer bag that has been demonstrated to enable the item to dry out in situ without leakage of DNA from the sealed bag.

10.2 General operational principles

- 10.2.1 Sufficient drying space capacity should be made available to ensure that the drying of submitted items can commence without delay during typical daily casework demand levels. As a contingency for exceptional peaks in demand, sufficient freezer space should be kept free for storage of items until drying space becomes available. Under no circumstances should the drying processes be accelerated by using heat or with fans.
- 10.2.2 Items between which a link may be of evidential significance should not be dried in the same space, for example, by sequentially drying one after the other in the same cabinet or room. Good practice (as of December 2014) operated by some FUs is to dry potentially linked items from the same case at different physical locations.

- 10.2.3 The drying cabinet should ideally have the following characteristics:
- a. Temperature controlled between 15.5°C and 24°C.
 - b. Humidity controlled, relative humidity not to exceed 60 per cent.
 - c. Under negative air pressure with 12 to 15 air changes per hour.
 - d. Air re-circulated through an activated high efficiency particulate air (HEPA) filter.
 - e. Drying area not in direct sunlight.
 - f. Walls, ceiling and floor shall have surfaces that readily allow decontamination.
 - g. A locking mechanism on the door to prevent access except by the authorised personnel.
- 10.2.4 Ideally a dedicated room(s) should be utilised, accessed by a lobby area for putting on/removing PPE / barrier clothing and equipped with commercially manufactured drying cabinets. These cabinets are specifically designed to meet the above specification and therefore will be easier to decontaminate than drying facilities that have been modified from other applications. Both the room and the drying cabinets within shall be subject to regular and effective cleaning regimes, and environmental monitoring. Further details on environmental monitoring can be found in FSR-G-208.

10.3 Decontamination of re-usable equipment between exhibits

- 10.3.1 The following are examples of how equipment may be decontaminated. However, it is essential that the processes adopted are documented and their effectiveness verified in the hands of the end-user. In all instances due consideration should be given to the health and safety implications of using these cleaning regimes. They shall be risk assessed and safe systems of work established prior to use.
- a. Items that are not suitable for immersion in fluid without damaging them should be thoroughly cleaned using a disposable cleaning roll or wipes liberally wetted with a chemical that inactivates and removes DNA. If direct contact with sources of DNA will occur, then the removal of the cleaning agent is necessary. Where equipment or items are susceptible to

corrosion, then an appropriate cleaning agent that does not corrode¹ shall be used.

- b. Small items thought to be contaminated that are suitable for immersion in fluid without damaging them should be submerged in a cleaning agent, scrubbed/wiped down to remove material. They should be rinsed in sterile distilled water should direct contact with sources of DNA for recovery occur.
- c. An example of cleaning surfaces (including drying cabinets) is as follows.
 - i. Spray the entire surface with a chemical at the concentration that is effective (for example, 1% solution of sodium hypochlorite destroys DNA).
 - ii. Leave for 5 minutes.
 - iii. Wipe the entire surface thoroughly using disposable cleaning roll (or similar).
 - iv. If direct contact with items for DNA recovery will occur, it may be necessary to clean with water to remove cleaning agent residue.

10.4 Handling procedure for drying

10.4.1 Between each use, the drying cabinet shall be decontaminated as detailed in 10.3.

10.4.2 Only one item should be handled at a time.

10.4.3 The packaging should be opened at the opposite end to the original seal so that the integrity of the original seal is verifiable if necessary. This shall be undertaken outside of, but very close to, the drying cabinet.

10.4.4 Paper should be placed under the item to capture any trace evidence that might fall off while it dries. This paper should be packaged separately and submitted with the item.

¹ Activ8™ contains no oxidising or corrosive ingredients and can therefore be used with confidence on all surfaces including fabrics and carpets (King's College London and Metropolitan Police Service, 2015).

- 10.4.5 Segregation of items and the handling of items potentially in the same case shall be observed at all times, for example, scene and suspect, victim and suspect, different suspects, different locations within a scene, and multiple scenes.
- 10.4.6 Once the items have dried they should be re-packaged and re-sealed using adhesive tape. Ideally the original packaging should be re-used, but where this is not possible, the item should be re-packaged and sealed in appropriate replacement packaging, and the original packaging should be retained for continuity purposes and recorded as a sub-item.
- 10.4.7 The location of the drying cabinet and the time and date of the drying (as well as any other samples in the batch) should be recorded in the event of quality assurance (QA) investigations, etc.

10.5 Record keeping

- 10.5.1 The following anti-contamination records shall be kept.
- a. Cabinet logs shall be maintained for each cabinet. These shall detail the following:
 - i. The exhibit number and incident reference number of each item.
 - ii. The person who placed the item in the cabinet including time and date, plus confirmation that the cabinet was decontaminated beforehand.
 - iii. The person who removed the item from the cabinet including time and date, plus confirmation that the cabinet was decontaminated afterwards.
 - b. Room access logs.
 - c. Competency records of staff accessing the drying facilities.
 - d. Cleaning logs.
 - e. Environmental monitoring records.
 - f. Case notes shall record where applicable:
 - i. That the item has been dried in-force; and

- ii. All instances where contamination is suspected in the handling and drying of the item, giving details of the incident.

10.6 Personnel considerations

- 10.6.1 Prior to being granted access to the drying cabinet facilities, each member of staff shall have demonstrated competency in operating the cabinets. Key to this is being trained in and through assessment demonstrating knowledge of:
 - a. Contamination issues;
 - b. The rationale behind anti-contamination measures; and
 - c. Practical knowledge of the anti-contamination-related SOPs employed in the handling of items and operation of the drying facilities to avoid contamination.
- 10.6.2 Issues relating to contamination risks and their avoidance in specific processes and methods shall be an integral part of staff training documentation and the relevant issues shall be included within the training plans and manuals.
- 10.6.3 This guidance appendix to the Codes (Forensic Science Regulator) shall be introduced to all new users of the drying facilities as part of their training.
- 10.6.4 Where a member of staff has a cold or other medical condition that risks compromising forensic casework, such as persistent coughing or sneezing, consideration should be given to excluding them from the drying area as per section 7.

10.7 Personal protective equipment (PPE)/ barrier clothing

- 10.7.1 Outdoor clothing, for example, coats, gloves, scarves, and other personal belongings are not permitted within the drying facility.
- 10.7.2 The following protective clothing shall be worn by all individuals including staff, visitors and service engineers when entering the drying area, and all of whom should provide an elimination sample.

Laboratory coats

- 10.7.3 Dedicated disposable laboratory coats that fully cover the neck, arms and wrist areas shall be worn and properly fastened. Alternatively a scene suit may be worn, fully fastened.
- 10.7.4 Coats/suits shall be changed before handling items from a different case, individual, location and where other circumstances dictate, for example, after handling a heavily stained exhibit.
- a. It is acceptable not to change laboratory coats when handling different items of clothes that have been worn at the same time by the same individual.
 - b. For handling volume crime samples, it is acceptable to use a lower cost alternative of wearing disposable paper aprons and sleeve covers over the laboratory coat and changing the apron and sleeve covers between items, rather than the laboratory coat.
- 10.7.5 Dedicated coats shall not be worn outside the drying area to which they have been assigned.

Gloves

- 10.7.6 Disposable gloves shall be worn at all times in the drying area, and removed when leaving the area. Two layers of gloves shall be worn; ideally powder-free nitrile or other suitable alternative (8.2.1e), and shall not be removed within the drying area.
- 10.7.7 The wrist of the glove should cover the wrist of the laboratory coat. Where this is not possible, disposable cuffs shall be used to cover the gap.
- 10.7.8 The outer set of gloves shall either be changed or cleaned using a validated method for the effective removal of DNA, whenever they come into contact with a potentially contaminated surface, for example, a door handle, chair, stationery, or when retrieving items from the floor.
- 10.7.9 Outer gloves shall be changed or cleaned between the handling of different items.

Face masks

- 10.7.10 When examining exhibits, pinch-nose face masks shall be worn that are properly tied and adjusted to cover the nose and mouth.
- 10.7.11 Touching the mask with gloved hands shall be avoided. If it is necessary to adjust the mask then the outer gloves shall be changed or cleaned.

Hair cover

- 10.7.12 Disposable mob caps or similar hair cover shall be worn entirely covering the head hair within the drying facility.
- 10.7.13 Where necessary, for example with bearded individuals, additional hair cover (snoods) shall be used to ensure that all facial hair is covered when used in conjunction with the face mask.

10.8 Gowning procedure

- 10.8.1 Ideally the gowning/disrobing procedure shall be undertaken in a lobby area or designated area proximal to the entrance/exit of the drying facility.
- 10.8.2 Gowning-up should be undertaken in an appropriate sequence, in line with the anti-contamination strategy an example of which is the following:
 - a. On entering lobby/room/designated area, immediately put on a face mask (and beard snood where required). Do not talk at all until the mask is securely fitted.
 - b. Then put on a mob cap and ensure that all hair is secure within the cap.
 - c. Next put on goggles or other eye protection where necessary.
 - d. Then put on the first pair of gloves.
 - e. Then put on disposable laboratory coat or scene suit.
 - f. Then put on overshoes; and finally
 - g. Put on the second pair of gloves.

11. Contamination Detection Measures

The Codes, 23.4 and FSR-P-302

- 11.1.1 It is recognised that even when all practicable precautions are taken to minimise the risk of contamination, incidents will still inevitably occur. The primary vectors for contamination transfer are personnel, equipment and consumables.
- 11.1.2 In the majority of circumstances there is no requirement to retain PPE/barrier clothing following a scene examination. However, consideration must be given to retain PPE/clothing where there has been the potential of any cross contamination during the examination. This should be applied to both the PPE worn by the scene examiners as well as clothing/footwear worn by the emergency responders/police officers etc. Where the decision is made to retain the PPE/Clothing it should be rationalised and fully documented.
- 11.1.3 Consumables that have been manufactured specifically to minimise the presence of DNA contamination should be used (see 8.3); manufacturers who are compliant with PAS 377:2012 /ISO 18385:2015 are required to generate and retain DNA profiles from manufacturing and assembly staff who are at risk of contaminating products so that comparisons may be performed against these profiles to check for potential contamination.
- 11.1.4 The provision of DNA profiles from staff whose role poses a high risk of contamination for routine screening of crime stain profiles is described in FSR-P-302 (Forensic Science Regulator).
- 11.1.5 All individuals entering the scene shall be recorded in the scene log. From a contamination perspective, these fall into the following two categories.
- a. All law enforcement staff whose roles routinely entail scene attendance and are therefore categorised as at high risk of contaminating material with their own DNA. The routine screening of these personnel is described in FSR-P-302. This requires profiles from these individuals to be held on a contamination elimination database, and these are routinely screened against each crime stain profile relevant to their police force or area prior to the crime stain profile being loaded on to the National DNA Database®

or reported in a particular case. All police personnel whose roles are categorised as a high contamination risk shall be included on the CED.

- b. Other individuals whose roles do not include routine attendance at scenes, (for example, first officer attending) and non-police personnel (for example, personnel from other emergency services) are not included on the CED and therefore not routinely screened against crime **stain** profiles for potential contamination events. These individuals may pose an even higher risk of contamination at a particular scene than the previous category. A first officer attending will not be wearing PPE/ barrier clothing, may have only basic forensic awareness training and their first priority is to deal with the immediate situation rather than contamination avoidance. Where contamination is suspected, then these individuals may be required to provide a sample for profiling and comparison for elimination purposes as a one-off exercise.

- 11.1.6 No individual should be permitted to enter the controlled scene of a serious **incident** unless they consent to being compared against crime stain profiles for potential contamination, where this is deemed necessary.

12. Management Oversight and Continuous Improvement

- 12.1.1 There shall be governance and oversight by the senior management of police, and other agencies undertaking scene recovery of DNA evidence, with regard to contamination avoidance, monitoring and detection, as described in this guidance, including the drying and temporary storage of items. This shall include a manager with appropriate technical knowledge having responsibility for:
 - a. Assessment and review of contamination, including responsibility for undertaking investigations into contamination events to identify the root cause, **potential of other cases being contaminated**, and for escalating contamination issues to senior management where required;
 - b. Maintaining a log of contamination events and periodically reviewing these to identify trends and potential for further anti-contamination measures as part of an overall continuous improvement process;

- c. Ensuring that the competence of staff is maintained and demonstrated through a formalised and effective competence management system; and
- d. Reviewing environmental monitoring results for **drying cabinets** to determine the ongoing efficacy of decontamination procedures

12.1.2 Reviews assessing contamination trends shall be made available to the Forensic Science Regulator/the Forensic Science Regulation Unit, the UK Accreditation Service and the **Forensic Information Databases Service (FINDS)** to enable overall trends within the industry to be monitored.

12.1.3 There should be good communication with staff and staff ownership of contamination issues. Improvement at the team/unit level should also be encouraged with regular feedback on performance, including notification of contamination events, plus trends in contamination incidents, with a view to continuous improvement in performance.

13. Acknowledgements

13.1.1 The FSR would like to thank Avon and Somerset Police, Cellmark Forensic Services, Derbyshire Police, Eurofins Forensic Services, Forensic Capability Network, Gloucestershire Constabulary, Greater Manchester Police, Northumbria Police, Scottish Police Authority Forensic Services, South West Forensics, Transforming Forensics, West Midlands Police, West Yorkshire Police and the Forensic Science Regulation Unit (FSRU) for the review and update of this appendix to the Codes.

14. Review

14.1.1 The published guidance will form part of the review cycle as determined by the Forensic Science Regulator.

14.1.2 The Forensic Science Regulator welcomes views on this guidance. Please send any comments to the address as set out on the Internet site at:
www.gov.uk/government/organisations/forensic-science-regulator or email:
FSREnquiries@homeoffice.gov.uk

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16. Abbreviations and Acronyms

Abbreviation	Meaning
BS	British Standard
CED	Contamination Elimination Database (national)
DNA	Deoxyribonucleic Acid
EN	European Standards
EtO	Ethylene Oxide
FINDS	Forensic Information Databases Service
FSR	Forensic Science Regulator
FU	Forensic Unit
IEC	International Electrotechnical Commission
ILAC	International Laboratory Accreditation Cooperation
ISO	International Organisation for Standardization
PAS	Publicly Available Specification
NIST	National Institute of Standards and Technology
PCR	Polymerase Chain Reaction
PPE	Personal Protective Equipment
SI	Scene Investigator
SOP	Standard Operating Procedure
UKAS	United Kingdom Accreditation Service
UNODC	United Nations Office on Drugs and Incident

17. Glossary

Consumables

Single-use commodities used in the collection, preservation and processing of material for forensic analysis. These include personal protective equipment, tamper evident containers, swabs, and packaging that come into direct contact with the material for forensic analysis. A consumable can also be equipment used in the collection, processing and safe handling of the material, for example, disposable tweezers and scissors.

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 of crime or a person.

DNA transfer

This can be categorised as follows:

Primary: direct or one step transfer process, for example, from person to person or person to object or object to object.

Secondary: two step transfer process for example, from person to surface to object.

Tertiary: three or more steps transfer process for example, from person to surface to equipment to consumable.

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. This may include not just the staff working within a specific facility, but also profiles from visitors to the facility, staff of manufacturers supplying consumables for DNA processing, and unsourced contamination profiles. 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 laboratories are also included.

Forensic Unit

A forensic unit is a legal entity or a defined part of a legal entity that performs any part of the forensic science process. [Source: ILAC-G19:08/2014 Modules in a Forensic Science Process.]

Investigator

A person, however named, trained to perform scene examinations and/or investigations.

Un-sourced contaminant

A DNA profile identified as a contaminant for which the source has not been identified; historically most have been found to come from manufacturing staff. Un-sourced contaminants are usually observed in no DNA template (negative) controls and quality control batch tests, or if the DNA profiling result appears at odds with pre-expectations.

18. Further Reading

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19. Annex

19.1 Table A. Examples of risk assessment for the use of DNA consumables by scene examiners

Risk No.	Process Step	Risk Description (In what ways can the process go wrong i.e. potential Failure Mode)	Potential Impact What is the impact on the Output - customer requirement or internal requirements?	Severity 1-10 (low to high)				Actions required to reduce/mitigate risk	Post- action			
				Impact	Likelihood	Detection Uncertainty	Risk Rating		Impact	Likelihood	Detection Uncertainty	Risk Rating
1	Purchase of Critical DNA consumables	Critical consumable items not delivered to forensic DNA grade	Contamination of recovered crime scene sample, resulting in misled investigation, protracted costs, missed identification of offender	9	4	8	288	1) Establish list of approved suppliers 2) Audit of Forensic Consumables Supplier against ISO18385 3) Supplier to provide a Quality Assurance Certificate verifying DNA grade for each batch	9	2	2	36
2		Consumables received are not of the intended specification	Contamination of recovered crime scene sample, resulting in misled investigation, protracted costs, missed identification of offender	9	3	8	216	1) Ensure all involved in purchasing consumables are aware of the requirement to refer to the approved suppliers list 2) Purchase forensic DNA grade consumables for high risk applications	9	2	2	36

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Risk No.	Process Step	Risk Description (In what ways can the process go wrong i.e. potential Failure Mode)	Potential Impact What is the impact on the Output - customer requirement or internal requirements?	Severity 1-10 (low to high)				Actions required to reduce/mitigate risk	Post- action			
				Impact	Likelihood	Detection Uncertainty	Risk Rating		Impact	Likelihood	Detection Uncertainty	Risk Rating
3	Consumables received from supplier at FU hub	Consumables delivered are unfit for purpose: damaged or differing to those ordered, thereby raising the risk of contamination.	Contamination of recovered crime scene sample, resulting in misled investigation, protracted costs, missed identification of offender	9	2	8	144	Introduce QA procedure to check that: 1) correct items have been delivered. 2) Packaging has not been damaged or compromised during delivery. 3) Shelf life of items is sufficient	9	2	2	36
4	Storage of Consumables	Consumables become contaminated in storage	Contamination of recovered crime scene sample, resulting in misled investigation, protracted costs, missed identification of offender	9	3	8	216	1) Restricted access to relevant, trained staff only, with DNA profiles held on Staff Elimination Database. 2) Cleaning process put in place 3) Generate SOP stipulating PPE and glove cleaning/ changing requirements 4) Consumables to be stored in plastic boxes on shelving. Large consumables to be kept covered.	9	2	2	36

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Risk No.	Process Step	Risk Description (In what ways can the process go wrong i.e. potential Failure Mode)	Potential Impact What is the impact on the Output - customer requirement or internal requirements?	Severity 1-10 (low to high)				Actions required to reduce/mitigate risk	Post- action			
				Impact	Likelihood	Detection Uncertainty	Risk Rating		Impact	Likelihood	Detection Uncertainty	Risk Rating
5	Transport of Consumables within vehicles	Contamination of the consumables within SI van during movement to and from the scene.	Contamination of recovered crime scene sample, resulting in misled investigation, protracted costs, missed identification of offender	9	4	5	180	1) Recorded vehicle cleaning protocol providing full audit trail. 2) High risk items now provided in smaller quantity packs 3) High risk items to be stored in a separate area therefore reducing unnecessary contact. 4) Only sealed exhibits to enter the vehicles and stored away from consumables	9	1	5	45
6	Movement of consumables from vehicle to scene	Contamination of the consumables during movement to and from the scene.	Contamination of recovered crime scene sample, resulting in misled investigation, protracted costs, missed identification of offender	9	4	5	180	1) Plastic bag to be utilised to take items from the van into the scene. 2) DNA case to be utilised to transport the high-risk items into the scene.	9	1	5	45

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Risk No.	Process Step	Risk Description (In what ways can the process go wrong i.e. potential Failure Mode)	Potential Impact What is the impact on the Output - customer requirement or internal requirements?	Severity 1-10 (low to high)				Actions required to reduce/mitigate risk	Post- action			
				Impact	Likelihood	Detection Uncertainty	Risk Rating		Impact	Likelihood	Detection Uncertainty	Risk Rating
7		High Risk Scene Case becomes contaminated	Contamination of recovered crime scene sample, resulting in misled investigation, protracted costs, missed identification of offender	9	3	5	135	1) High risk scene case subjected to cleaning with an auditable process. 2) Any high-risk item removed from the case is not to be replaced but disposed of due to potential contamination of external packaging when removed. 3) Appropriate PPE to be worn	9	1	5	45
8	Recovery of Crime Scene Stains	Using a swab or mini tape contaminated during manufacture	Contamination of recovered crime scene sample, resulting in misled investigation, protracted costs, missed identification of offender	9	4	8	288	1) Use of only agreed suppliers. 2) DNA collection devices to be EtO- treated/ ISO 18385 compliant 3) Fully auditable trail of batch numbers including QA certificate provided by the supplier.	9	2	2	36

19.2 Table B. Risk Rating Factors

Severity	Escalated to:	Rating	Degree of Severity	Probability of Occurrence		Ability Of Detection		Rating
				FREQUENCY (1 In ...)		Detection Certainty		
Low	Quality Unit / First Line Manager	1	Internal customer will notice a slight adverse effect, however its significant is not impactful and no detrimental effect will be made on the case outcome. The end customer will not experience any effect. (such as system amendments)	Likelihood of occurrence is remote	1,000,000	Sure, that the potential failure will be found or prevented before reaching the next customer	100%	1
Low	Quality Unit / First Line Manager	2	Internal Customer will probably experience slight inconvenience which is not impactful or detrimental to the case outcome. The end customer will not experience any effect. (such as system amendments, or minor incomplete paperwork)	Low failure rate with supporting documentation	20,000	Almost certain that the potential failure will be found or prevented before reaching the next customer	99%	2
Low	Quality Unit / First Line Manager	3	Internal Customer will experience inconvenience due to the slight degradation of performance, such as computer or equipment malfunction or user error	Low failure rate without supporting documentation	8	Low likelihood that the potential failure will reach the next customer undetected	95	3
Moderate	Second Line Manager and Quality Manager	4	External Customer dissatisfaction occurs due to reduced performance	Occasional failures	5	Controls may detect or prevent the potential failure from reaching the next customer	90	4

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Severity	Escalated to:	Rating	Degree of Severity	Probability of Occurrence		Ability Of Detection		Rating
				FREQUENCY (1 In ...)		Detection Certainty		
Moderate	Second Line Manager and Quality Manager	5	Internal Customers productivity is reduced by the continued degradation of the effect	Relatively moderate failure rate with supporting documentation	4	Moderate likelihood that the potential failure will reach the next customer	85	5
Moderate	Second Line Manager and Quality Manager	6	Unit equipment repair or significant occurrence which effects unit such as major long term (days) network outage or unit area shutdown- not effecting case work	Moderate failure rate without supporting documentation	4	Controls are unlikely to detect or prevent the potential failure from reaching the next customer	80	6
Substantial	Head of Unit and Quality Manager and Director of Forensic Services	7	High degree of external customer dissatisfaction due to component failure/equipment or Unit area without complete loss of departmental function. Casework impacted or destroyed (such as wrong full treatment; Chemical Treatment before DNA recovery) where results are still possible due to rework levels.- case value reduced.	Relatively high failure rate with supporting documentation	2	Poor likelihood that the potential failure will be detected or prevented before reaching the next customer	70	7

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Severity	Escalated to:	Rating	Degree of Severity	Probability of Occurrence		Ability Of Detection		Rating
					FREQUENCY (1 In ...)		Detection Certainty	
Substantial	Head of Unit, Quality Manager , Director of Forensic Services (Or equivalent) and UKAS	8	Very high degree of dissatisfaction due to the loss of value of casework, without a negative impact on safety or governmental regulations.	High failure rate without supporting documentation	2	Very poor likelihood that the potential failure will be detected or prevented before reaching the next customer	60	8
Severe	Head of Unit, Quality Manager , Director of Forensic Services (Or equivalent) and UKAS	9	Multipul cases adverse effect on safe system performance with warning before failure or violation of governmental regulations	Failure is almost certain based on investigation, testing and analysis	1	Current controls probably will not even detect the potential failure	50	9
Severe	Head of Unit, Quality Manager , Director of Forensic Services (Or equivalent) and UKAS	10	Customer endangered due to the adverse effect on safe system performance without warning before failure or violation of governmental regulations	Assured of failure based on investigation, testing and analysis	1	Absolute certainty that the current controls will not detect the potential failure	< 50	10

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