SCIENTIFIC WORKING GROUP ON DNA ANALYSIS METHODS[1]

Supplemental Information for the SWGDAM Contamination Prevention and Detection Guidelines for Forensic DNA Laboratories

SHORT TITLE: ***Contamination FAQs Supplement***

APPROVED AND EFFECTIVE: March 18, 2026

[1] The Scientific Working Group on DNA Analysis (SWGDAM; see SWGDAM.org) is comprised of forensic science practitioners and other experts who represent government laboratories within the U.S and Canada, as well as intra- and international professional groups and academia. SWGDAM recommends to the FBI Director revisions to the *Quality Assurance Standards for Forensic DNA Testing Laboratories* and the *Quality Assurance Standards for DNA Databasing Laboratories (QAS)*. SWGDAM provides a forum for its members and invited guests to discuss research, technologies, techniques, and training; and conduct or recommend studies to develop, test, and validate methods for use by forensic laboratories. SWGDAM's Guidelines and Recommendations represent best practices within the discipline. The term "should" is used herein to indicate good practices identified by SWGDAM. "Shall" distinguishes mandatory elements, which may be specified in the Quality Assurance Standards for Forensic DNA Testing Laboratories and/or Quality Assurance Standards for DNA Databasing Laboratories.

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Document Scope

This document intends to provide clarification for the SWGDAM Contamination Prevention and Detection Guidelines for Forensic DNA Laboratories (2017) in the form of frequently asked questions (FAQs). SWGDAM is preparing an updated version of the Contamination Prevention and Detection Guidelines for Forensic DNA Laboratories to address developments in robotic systems and new technologies such as Next Generation Sequencing (NGS) and Rapid DNA. Updated guidance is offered here in the interim.

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FAQ-1: Should reference and evidentiary samples be processed together?

Cross-reference Guideline 2.1.2

Care should be taken to separate samples by type when handling evidence and setting up for extraction. It is best practice to separate reference samples and evidentiary samples by time or space in subsequent processing, especially during extraction. However, it is acceptable to combine reference and evidentiary samples from extraction through detection if the laboratory uses validated procedures that have adequately evaluated the contamination risk.

A laboratory should use their validation studies to demonstrate appropriate separation by time and/or space. For example, if using a robotic liquid handling system, reference and evidentiary samples may be processed at the same time but arranged across the plate in a way that keeps them physically isolated. When possible, script development should incorporate the following: the handling of low and high quantity samples, path optimization planning, overflight awareness, movement speeds, and air gaps. Additional considerations such as extended bleach holds during fixed tip decontamination may also be necessary for some applications (i.e., mitochondrial DNA processing).

FAQ-2: What are some considerations for decontamination?

Cross-reference Guideline 2.6

It is important to distinguish between decontaminants and disinfectants, as they serve different functions. Decontaminants are used to remove or degrade residual DNA, thereby reducing the risk of DNA contamination during laboratory processing, whereas disinfectants have antimicrobial properties and may not affect DNA. For example, while common kitchen countertop cleaners that kill bacteria and viruses may render spills of body fluids biologically "safe," they may not effectively degrade or remove DNA. Cleaning agents classified as disinfectants include alcohol, halogens, phenols, heavy metals, and quaternary ammonium compounds. These agents are important for addressing biological hazards in the laboratory, which are often introduced through evidence handling.

Decontaminants that degrade DNA include both physical and chemical approaches. Autoclaving and ultraviolet (UV) irradiation are physical methods that may be used to reduce the presence of DNA (Gefrides et al., 2010). However, neither method "removes" DNA. Instead, autoclaving shears DNA into smaller, often still amplifiable fragments, while UV irradiation induces DNA crosslinking. Although sufficient UV energy can inhibit amplification by DNA polymerase, it may not entirely prevent amplification of short fragments.

DNA decontamination in laboratory settings can be achieved through a variety of chemical methods. Sodium hypochlorite (bleach) is the most commonly used agent, functioning as both a decontaminate and a disinfectant. Commercial bleach contains 2-10% (w/v) sodium

hypochlorite, with working concentrations ranging from 0.3% to 10% depending on the application. For high-risk or critical processes (e.g., decontamination of robotic fixed tips), laboratories should be aware of the stock concentration used in the validation and may need to use a concentration at the higher end of the typically available range. For routine processes such as benchtop decontamination, lower concentrations are generally sufficient. Publications are available that suggest appropriate concentrations depending on use (Ballantyne et al., 2015, Frégeau et al., 2008, Kampmann et al., 2017).

Diluted bleach degrades over time, and fresh solutions should be prepared at least weekly. Various DNA analysis procedures may be affected by additives, such as the blue dyes present in certain commercial bleach formulations. Reagent-grade bleach is recommended when available; otherwise, a bleach preparation lacking additives should be used. Bleach should also be handled with care in the DNA laboratory, as fumes can degrade the fluorescent dyes used in STR kits (Thermo Fisher Smart Note, 2023). Residual bleach can be removed with water or ethanol. Other non-bleach DNA degrading solutions are available. These solutions degrade DNA but do not necessarily disinfect (i.e., kill pathogens). They are often used because they are less detrimental to countertops and instrument surfaces and are more chemically stable over time.

Regardless of which solution is used for decontamination, one possible method of decontaminating gloves instead of changing them is to soak a paper cloth in the preferred decontaminating solution and to use that cloth to wipe the gloves thoroughly. Gloves should be dried before use. Ethanol may be used to remove any additional decontaminant and dry the gloves more quickly. If visible contamination of the gloves with bodily fluids or other biological materials is present, gloves should be changed.

FAQ-3: What are some examples of contamination event reporting statements?

The following are examples for reporting the presence of contamination and are not meant to be all inclusive. It is important to note that in cases of staff contamination, names and profile information should be kept confidential and not included in the report.

- *No interpretations or comparisons can be made to [this sample/these samples] because of (internal/external) quality control reasons.*

- *Contamination from an unknown source was obtained in a control sample associated with this case. This contamination did not appear to affect the reported results for this case.*

- *Due to a quality event, this item was extracted twice.*

- *Contamination occurred in a control sample.*

- *The negative control that was processed together with item 1 displayed possible contamination. No sample remains from item 1 for retesting; however, because the DNA*

results from the possible contaminant are not present in item 1, and therefore not systemic in nature, the DNA results for item 1 were used for comparison purposes.

- *DNA consistent with laboratory staff was present in the DNA obtained from item 1. This individual was involved in the processing or handling of item 1, and retesting was not possible. Therefore, this individual was treated as an assumed contributor to the DNA obtained from item 1 and will further be referred to as STAFF.*

- *The minor alleles/DNA Profile detected in item X are/has been attributable to contamination from laboratory staff.*

- *A laboratory employee cannot be excluded as a possible (minor/low level/trace) contributor to this DNA mixture and/or profile.*

- *The DNA profile obtained from X was inconclusive as it did not meet quality control requirements. This item is eligible for additional testing upon request and with permission to consume.*

- *The DNA typing profile from item X (item description) is of mixed origin, consistent with having originated from (#) individuals. The profile of the major/minor/one component is consistent with that of [a staff member of the forensic laboratory/a co-processed sample/a profile attributed to the manufacturing and/or packaging of a commercially available consumable product used within the laboratory].*

- *The DNA typing profile from item X (item description) is of mixed origin, consistent with having originated from (#) individuals. Due to a contamination event during processing, this profile is not suitable for further interpretation.*

- *The DNA typing profile from item X is of mixed origin, consistent with having originated from (#) individuals. [The profile of [a staff member of the forensic laboratory/a co-processed sample/a profile attributed to the manufacturing and/or packaging of a commercially available consumable product used within the laboratory] is a possible contributor to this mixed profile. Assuming this profile is one of the contributors to this mixed profile, then the profile of the other contributor...*

- *The negative control that was processed together with item 1 displayed possible contamination. The DNA typing results obtained from the negative control were observed in one or more samples or controls and therefore, may be systemic.*

The systemic contamination statement above may be supplemented with the wording below depending upon the specific situation.:

- *No sample remains from item 1 for retesting; therefore, no conclusion can be offered in regard to item 1.*

- *No sample remains from item 1 for retesting; however, no DNA foreign to [name of contributor] was obtained from item 1.*

- *No sample remains from item 1 for retesting; however, no DNA was obtained from item 1.*

FAQ-4: What other SWGDAM standards/guidance documents discuss contamination?

All documents listed below are available at https://www.swgdam.org/publications.

- Quality Assurance Standards for Forensic DNA Testing Laboratories.

- Quality Assurance Standards for DNA Databasing Laboratories.

- SWGDAM Guidelines for the Use of Probabilistic Genotyping with Autosomal STR Typing Results.

- SWGDAM Guidelines for STR Enhanced Detection Methods.

- SWGDAM Interpretation Guidelines for Mitochondrial DNA Analysis by Forensic DNA Testing Laboratories.

- Supplemental Information for the SWGDAM Interpretation Guidelines for Mitochondrial DNA Analysis by Forensic DNA Testing Laboratories.

- SWGDAM Interpretation Guidelines for Single Nucleotide Polymorphism (SNP) Analysis by Forensic DNA Testing Laboratories.

- SWGDAM Validation Guidelines for the Use of an Expert System with Forensic Samples.

- SWGDAM Validation Guidelines for DNA Analysis Methods.

- SWGDAM Training Guidelines.

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Document Version	Revision History
March 2026	Original. Drafted to provide updated guidance for the 2017 version of the SWGDAM Contamination Prevention and Detection Guidelines for Forensic DNA Laboratories.