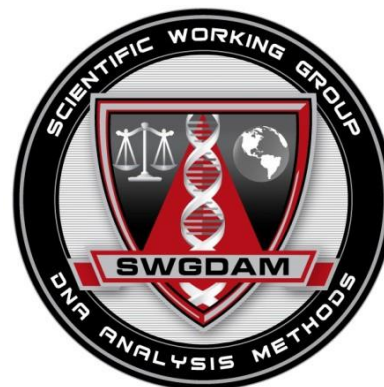


Scientific Working Group on DNA Analysis Methods

Training Guidelines



SWGDM Training Guidelines

The Scientific Working Group on DNA Analysis Methods, better known by its acronym of SWGDAM, is a group of approximately 50 scientists representing federal, state, and local forensic DNA laboratories in the United States and Canada. During meetings, which are held twice a year, committees discuss topics of interest to the forensic DNA community and often develop documents to provide direction and guidance for the community. This document was presented to SWGDAM and received approval on July 7, 2020.

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This document provides guidelines for training of laboratory personnel throughout the forensic DNA community and supersedes the previous versions of the Scientific Working Group on DNA Analysis Methods (SWGDM) Training Guidelines (see revision history). The revised guidelines are not intended to be applied retroactively. Laboratories are encouraged to review their standard operating procedures and training programs in light of these guidelines and to update their procedures as needed. It is anticipated that these guidelines will evolve further as future technologies emerge.

Introduction

The FBI Director's current Quality Assurance Standards for Forensic DNA Testing Laboratories and Quality Assurance Standards for DNA Databasing Laboratories (QAS) include education and training requirements for laboratory personnel involved in forensic DNA analysis. Specific course requirements, in-house laboratory training and assessment, and the minimum experience for laboratory personnel are further explained in the Guidance Document for the FBI Quality Assurance Standards for Forensic DNA Testing and DNA Databasing Laboratories. The Quality Assurance Standards for Forensic DNA Testing Laboratories and the Quality Assurance Standards for DNA Databasing Laboratories have precedence over the QAS Guidance Document and these SWGDAM Training Guidelines.

In 2001, SWGDAM prepared guidelines for training new personnel in laboratories performing DNA analysis. Subsequent revisions of the QAS necessitated updating these guidelines to ensure consistency with the most current QAS. The 2020 revision of the QAS, includes Standard 6 that specifically addresses training requirements, and should be reviewed in conjunction with these guidelines. These training guidelines are based on the QAS and input from members of SWGDAM and the forensic community and are intended to assist forensic and DNA databasing laboratories in developing training programs.

The primary emphasis of the guidelines is to provide a model program of standardized study and training for laboratory personnel throughout the forensic DNA community. The benefits of these guidelines include improving the overall quality and consistency of work in laboratories performing forensic DNA analysis and developing the technical skills and knowledge of competent laboratory staff.

This recommended training program employs a module system for new employees and current employees with no prior DNA experience. Trainees should successfully complete each module. The trainee's education should be reviewed to ensure compliance with applicable accreditation, QAS, and laboratory education requirements. In accordance with the QAS, a trainee with previous experience in forensic or other DNA analysis may not

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require all modules or steps; it is the responsibility of the DNA technical leader to determine the duration and scope of the training program for a trainee with previous experience and/or training in forensic DNA analysis. Similarly, the module content may be tailored as applicable to various job responsibilities. The module content should be customized to include all aspects of procedures and policies of the laboratory. The laboratory or laboratory system should retain all documentation of the trainee's work according to the laboratory's document retention policy.

The laboratory should develop a documented training program to include the following:

- Training manual covering all DNA analytical procedures that the laboratory personnel will perform
- Training program that defines the technical skills and knowledge required to perform DNA analysis
- Documentation of completing the specified tasks in each module, including competency testing.

A training program should mirror actual procedures used in casework/database analysis whenever possible and also include the use of applicable Laboratory Information Management System (LIMS), reagent tracking, quality control procedures, evidence handling procedures, and administrative functions.

Any newly validated technology, method, typing test kit, platform, or interpretation software, implemented by the laboratory should be incorporated into the laboratory's training program as soon as practicable.

These guidelines reference the “trainee” which is intended to apply to any DNA laboratory personnel. References to the “analyst” are intended to apply specifically to DNA analyst trainees. These guidelines should be tailored to meet the needs of individual laboratories and their laboratory personnel.

1. Laboratory Introduction

1.1 Goal

An introduction to the laboratory and the training program should be developed and provided. Upon completion, the trainee should be familiar with the general operation of the forensic laboratory and the expectations of the training program.

1.2 Scope

Module should be completed by laboratory personnel as applicable by job responsibility and the extent to which the trainee will participate in DNA analysis.

1.3 Tasks

1.3.1 Review the responsibilities of the trainer and the trainee, including specific job responsibilities

1.3.2 Receive an orientation to the laboratory facility

1.3.3 Receive an overview of the organization and management, goals and objectives, organizational structure/hierarchy of the forensic laboratory, laboratory administrative policies, and evidence management

1.3.3.1 Familiarization with other forensic disciplines practiced in the laboratory

1.3.3.2 Awareness of order of evidence examinations

1.3.4 Review the security and confidentiality policies/procedures of the forensic laboratory

1.3.5 Review the quality assurance/quality control program

1.3.5.1 Quality assurance/quality control manual(s)

1.3.5.2 Documentation requirements including the laboratory's LIMS, if applicable

1.3.5.3 Non-conformances and corrective actions

1.3.5.4 Audits and accreditation

1.3.5.5 Proficiency tests

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1.3.5.6 Equipment calibration and maintenance

1.3.6 Receive an introduction to the potential factors effecting human performance

1.3.6.1 Code of ethics and professional responsibility

1.3.6.2 Impartiality

1.3.6.3 Laboratory system design

1.3.6.4 Risk mitigation

1.3.7 Review the safety policies/procedures of the forensic laboratory

1.3.7.1 Personal Protective Equipment (PPE)

1.3.7.2 Biohazards

1.3.7.3 Chemical hygiene plan

1.3.7.4 Fire safety

1.3.7.5 Waste management program

1.3.7.6 Bloodborne pathogens procedures

1.3.7.7 Safety Data Sheets

1.3.7.8 Laboratory policy on reporting safety incidents

1.3.7.9 Decontamination procedures

1.4 Reading Assignments

1.4.1 Training manual

1.4.2 Quality assurance/quality control manual(s)

1.4.3 Administration manual and operations manual

1.4.4 Safety manual

1.4.5 Accreditation standards document(s)

1.4.6 Quality Assurance Standards for Forensic DNA Testing Laboratories and/or
Quality Assurance Standards for DNA Databasing Laboratories

1.4.7 The Guidance Document for the FBI Quality Assurance Standards (QAS)

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for Forensic DNA Testing Laboratories and DNA Databasing Laboratories

1.4.8 DNA Technology in Forensic Science, National Research Council (1992), Chapters 4 and 7

1.4.9 The Evaluation of Forensic DNA Evidence, National Research Council (1996), Chapter 3

1.4.10 Department of Justice (2016), *Code of Professional Responsibility for the Practice of Forensic Science*. Available at <https://www.justice.gov/>

1.5 Assessment

1.5.1 Ensure the trainee has documented completion of module

2. Fundamental and Applied Scientific Knowledge

2.1 Goal

To educate the trainee on the specific knowledge related to the field of forensic DNA analysis. The level of detail should be applicable to the trainee's job responsibilities.

2.2 Scope

Module should be completed by laboratory personnel as applicable by job responsibility and the extent to which the trainee will participate in DNA analysis.

2.3 Tasks

2.3.1 Develop in-depth theoretical understanding of the technologies, methodologies and platforms appropriate to the work being conducted in the laboratory and basic theoretical understanding of the historical technologies, methodologies and platforms

2.3.1.1 Extraction

2.3.1.2 Quantification

2.3.1.3 Amplification

2.3.1.4 DNA Typing/Sequencing

2.3.1.5 Statistical applications

2.4 Reading Assignments

2.4.1 Developmental validation studies

2.4.2 Laboratory's validation data

2.4.3 The Evaluation of Forensic DNA Evidence, National Research Council (1996), Chapters 1 & 2

2.4.4 Additional reading assignments (i.e., peer-reviewed scientific literature) as determined by the laboratory based upon assessment of the trainee's education and prior experience (Refer to the Recommended References)

2.5 Assessment

2.5.1 Ensure the trainee possesses an understanding of the fundamental and applied scientific knowledge as it applies to forensic DNA analysis, as determined by the technical leader

3. Sample and/or Evidence Control

3.1 Goal

To develop an understanding of sample and/or evidence control in the forensic laboratory.

3.2 Scope

Module should be completed by laboratory personnel as applicable by job responsibility and the extent to which the trainee will participate in DNA analysis.

3.3 Tasks

3.3.1 Receive instruction on the following, as applicable:

3.3.1.1 Sample and/or evidence collection, packaging, and storage

3.3.1.2 Chain of custody, receiving, and handling samples and/or evidence

3.3.1.3 Minimizing contamination of samples and/or evidence

3.3.1.4 Sample and/or case acceptance policy

3.3.1.5 Consumption of samples and/or evidence

3.3.1.6 Distinction between evidence and work product

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3.3.1.7 Laboratory documentation policy (paper and/or electronic)

3.4 Reading Assignments

3.4.1 Laboratory evidence-handling procedure (for forensic laboratory)

3.4.2 Sample inventory and control procedure (for databasing laboratory)

3.4.3 Sample and/or case acceptance policy

3.4.4 Sample consumption policy

3.4.5 SWGDAM Contamination Prevention and Detection Guidelines for Forensic DNA Laboratories, approved January 12, 2017 or the most recent version available at <http://www.swgdam.org>

3.5 Assessment

3.5.1 Ensure the trainee has documented completion of module

4. Laboratory Processing

4.1 Goal

To provide practical instruction to the trainee on technologies, methods and platforms used in the laboratory.

4.2 Scope

Module should be completed by laboratory personnel as applicable by job responsibility and the extent to which the trainee will participate in DNA analysis.

4.3 Tasks

4.3.1 Receive instruction, training, and demonstrate competence in each method that they will perform

4.3.1.1 The samples included in practical exercises should be representative of the range, type, and complexity of casework or database technologies, methods and platforms in accordance with the trainee's job responsibilities and the extent to which the trainee will participate in DNA analysis

4.3.1.2 The number of samples analyzed by the trainee should be sufficient to demonstrate the trainee's ability to competently conduct the laboratory's

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analytical procedures to produce reliable and accurate results

4.3.2 Compile records during the performance of the analytical procedures

4.4 Reading Assignments

4.4.1 Laboratory's analytical procedures

4.4.2 Kit manufacturer's literature

4.4.3 User's manuals for platforms and kits

4.4.4 Additional reading assignments (i.e., peer-reviewed scientific literature) as determined by the laboratory (Refer to the Recommended References)

4.5 Assessment

4.5.1 Review and approval of records compiled by trainee

4.5.2 Successful completion of competency testing including practical components of laboratory processing

5. Analysis and Interpretation

5.1 Goal

To provide practical instruction to the analyst on analysis and interpretation of DNA data for the technologies, methodologies and platforms used in the laboratory.

5.2 Scope

Module should be completed by analysts in accordance with the analyst's job responsibilities and the extent to which the analyst will participate in DNA analysis.

5.3 Tasks

5.3.1 Receive instruction, training, and demonstrate competence in both analysis and interpretation for the following areas, as applicable, as they relate to the laboratory's analytical procedures:

5.3.1.1 Each technology (e.g., STR, YSTR, XSTR, SNP, microhaplotypes or mitochondrial DNA) for single-source and mixed DNA profiles

5.3.1.2 Legacy technologies, typing test kits, or platforms

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5.3.1.3 Laboratory's criteria for inclusions, exclusions, and inconclusive conclusions

5.3.1.4 Paternity/Kinship analysis

5.3.1.5 Statistical analysis

5.3.1.6 Expert Systems

5.3.1.7 Interpretation software

5.3.1.8 CODIS software

5.3.2 Compile records during analysis and interpretation of DNA profiles generated during laboratory processing and/or other practical exercises

5.3.3 The samples included in practical exercises should be representative of the range, type, and complexity of casework or database technologies, methods and platforms in accordance with the analyst's job responsibilities and the extent to which the analyst will participate in DNA interpretation and analysis

5.4 Reading Assignments

5.4.1 Laboratory's interpretation guidelines

5.4.2 Validation studies

5.4.3 Laboratory's quality assurance/quality control procedures

5.4.4 SWGDAM Interpretation Guidelines for Autosomal STR Typing by Forensic DNA Testing Laboratories, approved January 12, 2017 or the most recent version available at <http://www.swgdam.org>

5.4.5 SWGDAM Interpretation Guidelines for Y-Chromosome STR Typing (if applicable), approved January 9, 2014 or the most recent version available at <http://www.swgdam.org>

5.4.6 SWGDAM Interpretation Guidelines for Mitochondrial DNA Analysis by Forensic DNA Testing Laboratories (if applicable), approved April 23, 2019 or the most recent version available at <http://www.swgdam.org>

5.4.7 Additional applicable SWGDAM Guidance documents available at

<http://www.swgdam.org>

5.4.8 The Evaluation of Forensic DNA Evidence, National Research Council (1996), Chapters 4 & 5

5.4.9 NDIS Operational Procedures Manual, Version 9 or the most recent version available at <https://www.fbi.gov/file-repository/ndis-operational-procedures-manual.pdf/view>

5.4.10 Additional reading assignments (i.e., peer-reviewed scientific literature) as determined by the laboratory (Refer to the Recommended References)

5.5 Assessment

5.5.1 Review and approval of records compiled by analyst

5.5.2 Successful completion of competency testing including practical components of analysis and interpretation

6. Reports and/or Notifications

6.1 Goal

To provide instruction to an analyst on reporting analytical results or issuing written notifications according to the laboratory's policy.

6.2 Scope

Module should be completed by analysts in accordance with the analyst's job responsibilities and the extent to which the analyst will participate in DNA analysis.

6.3 Tasks

6.3.1 Receive instruction in the following:

6.3.1.1 Laboratory policy on case or sample file content

6.3.1.2 Report writing, as applicable

6.3.1.3 Written notifications, as applicable

6.3.1.4 Technical and administrative reviews

6.3.1.5 Report/notification issuance according to laboratory policy

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6.3.1.6 Confidentiality/disclosure of information according to laboratory policy

6.3.2 Review reports/notifications prepared by other analysts within the laboratory

6.3.3 Prepare reports/notifications of analysis and interpretation of DNA profiles generated during previous modules and/or other practical exercises according to laboratory policy

6.3.4 The practical exercises should be representative of the range, type, and complexity of casework or database technologies, methodologies and platforms in accordance with the analyst's job responsibilities and the extent to which the analyst will participate in DNA analysis

6.4 Reading Assignments

6.4.1 Laboratory report writing policies and procedures

6.4.2 Qualifying offenses for jurisdiction, as applicable for CODIS entry and release of personally identifiable information (PII)

6.4.3 Technical and administrative review procedures

6.4.4 Procedures for issuance and confidentiality of laboratory reports/notifications

6.5 Assessment

6.5.1 Review and assessment of reports/notifications prepared by analyst for accuracy

7. Legal Issues

7.1 Goal

To instruct the trainee on the legal system in his/her jurisdiction and to prepare the trainee to testify as a fact or expert witness, as applicable.

7.2 Scope

Module should be completed by laboratory personnel as applicable by job responsibility and the extent to which the trainee will participate in DNA analysis.

7.3 Tasks

7.3.1 Receive instruction in the following topics, as applicable:

7.3.1.1 Courtroom procedures and rules of evidence process

7.3.1.1.1 Court structure (trial and appeals courts)

7.3.1.1.2 Format of hearing or trial

7.3.1.1.3 Discovery and admissibility rules

7.3.1.1.4 Courtroom demeanor and attire

7.3.1.2 Professional qualifications (i.e., voir dire)

7.3.1.2.1 Minimum education and experience requirements of a DNA analyst

7.3.1.3 Effective communication of technical information

7.3.1.4 Ethical responsibility of expert witness

7.3.1.5 Evidence/exhibit presentation

7.3.1.6 DNA database legal authority (state and federal)

7.3.1.6.1 Permissible samples/profiles

7.3.1.6.2 Confidentiality/disclosure of information

7.3.2 Prepare a curriculum vitae

7.3.3 Observe expert testimony

7.3.4 Practice testimony (direct and cross examination)

7.4 Reading Assignments

7.4.1 Relevant transcripts, case law, and court decisions

7.4.2 Federal DNA Identification Act (34 U.S.C. §12592) and applicable state DNA database law

7.4.3 DNA Technology in Forensic Science, National Research Council (1992), Chapters 4, 5, 6, and 7

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7.4.4 The Evaluation of Forensic DNA Evidence, National Research Council (1996), Chapter 6

7.4.5 Committee on Identifying the Needs of the Forensic Science Community; Committee on Applied and Theoretical Statistics, National Research Council, Strengthening Forensic Science in the United States: A Path Forward (2009)

7.5 Assessment

7.5.1 Review the trainee’s oral communication skills through a laboratory determined assessment and/or mock court exercise

7.5.2 The analyst’s completion of this module should be demonstrated by a minimum of one successful mock court exercise

7.5.2.1 The mock court testimony should include direct and cross examination as well as the introduction of evidence/exhibits

7.5.2.2 Documentation of the mock court exercise should contain an evaluation of the analyst's performance and be retained by the laboratory

8. Final Evaluation

8.1 At the completion of the training program, the trainee will have successfully passed competency testing as applicable by job responsibility and the extent to which the trainee will participate in DNA analysis.

8.2 The trainee should compile training records for review and approval.

8.3 The technical leader shall review the training records for the trainee and approve his/her qualifications.

8.4 The laboratory shall authorize the trainee to independently perform assigned job responsibilities and the date(s) shall be documented.

8.5 If at any point retraining is required, portions of these guidelines may be administered as appropriate. The technical leader is responsible for evaluating the need for, and assessing the extent of, retraining.

Recommended References

The following resources may be helpful to the trainer in defining the breadth and scope of the materials for the trainee's reading. This list is not meant to be all inclusive. The laboratory should develop a list tailored to its specific needs. In accordance with the FBI Director's Quality Assurance Standards, the laboratory is responsible for reviewing and updating the training manual annually. Updated references should be added to the laboratory's list during this review period or when new methodologies or technologies are incorporated into the laboratory protocols.

General Forensic DNA and Autosomal STRs

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Informational Web Sites: Additional information may be obtained from the following web sites:

The Department of Justice - Uniform Language for Testimony and Reports

<https://www.justice.gov/olp/uniform-language-testimony-and-reports>

The Federal Bureau of Investigation (FBI) - Combined DNA Index System (CODIS)

<https://www.fbi.gov/services/laboratory/biometric-analysis/codis>

The National Institute of Justice

www.nij.gov

The National Institute of Standards and Technology (NIST) - Short Tandem Repeat DNA Internet Database (STRBase)

www.cstl.nist.gov/strbase

The Scientific Working Group on DNA Analysis Methods (SWGDM)

<https://www.swgdam.org>

The Y chromosome Haplotype Reference Database (YHRD)

<http://www.yhrd.org/>

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January 2001	Original. (Published in Forensic Science Communications in October 2002, Vol. 4, No. 4; available at http://www.fbi.gov/about-us/lab/forensic-science-communications/fsc/oct2001/kzinski.htm).
January 2013	The document was revised to ensure consistency with the FBI Director's Quality Assurance Standards, including the addition of a new section 6 on Interpretation and Analysis and a new section for References and Literature Cited listed by topic. The revisions were approved by the SWGDAM membership on January 17, 2013.
July 2020	The document was revised to ensure consistency with the FBI Director's Quality Assurance Standards taking effect on July 1, 2020, including the merging of the fundamental and applied scientific knowledge sections (now Section 2) and updated references. The revisions were approved by the SWGDAM membership on July 7, 2020.