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Standard for Forensic DNA Training Programs

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Foreword

A quality training program is essential for forensic DNA and database testing laboratories. The purpose of the training program is to provide the foundation for ensuring DNA testing procedures are correctly performed; the DNA data obtained are appropriately analyzed, interpreted, and compared; and statistical evaluations, reports, and testimony are accurately provided and properly communicated.

This standard is intended for DNA laboratory personnel involved in DNA testing of casework and/or database samples. It is a foundational training program standard and serves as a normative reference for other training standards. The associated standards will provide more specific requirements for training in various stages of the DNA testing and reporting process from the bench to the courtroom. See Annex A, Bibliography for a list of the associated DNA training standards.

Laboratories are advised to review their forensic DNA training program for compliance with these requirements and to supplement or modify the existing training program accordingly.

This standard addresses the training and competency of DNA laboratory personnel. It does not involve the maintenance of proficiency or consistency among trained personnel after training has been completed. See ANSI/ASB Standard 123, *Standard for Routine Internal Evaluation of a Laboratory's DNA Interpretation and Comparison Protocol* for additional information on proficiency and consistency.

The American Academy of Forensic Sciences established the Academy Standards Board (ASB) in 2015 with a vision of safeguarding Justice, Integrity and Fairness through Consensus Based American National Standards. To that end, the ASB develops consensus based forensic standards within a framework accredited by the American National Standards Institute (ANSI), and provides training to support those standards. ASB values integrity, scientific rigor, openness, due process, collaboration, excellence, diversity and inclusion. ASB is dedicated to developing and making freely accessible the highest quality documentary forensic science consensus Standards, Guidelines, Best Practices, and Technical Reports in a wide range of forensic science disciplines as a service to forensic practitioners and the legal system.

This document was revised, prepared, and finalized as a standard by the DNA Consensus Body of the AAFS Standards Board. The draft of the first edition of this standard was developed by the Biological Methods and Biological Data Interpretation and Reporting Subcommittees of the Organization of Scientific Area Committees (OSAC) for Forensic Science.

Questions, comments, and suggestions for the improvement of this document can be sent to AAFS-ASB Secretariat, asb@aaafs.org or 401 N 21st Street, Colorado Springs, CO 80904.

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Keywords: *forensic DNA training, DNA training program, forensic DNA competency testing*

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Standard for Forensic DNA Training Programs

1 Scope

This standard provides the requirements for a forensic DNA laboratory's training program in laboratory methods, data analysis, interpretation and comparison, statistical evaluation, database searching, reporting, and testimony.

2 Normative References

The document contains no normative references. See Annex A, Bibliography for other references.

3 Terms and Definitions

For purposes of this document, the following definitions apply.

3.1

competency

The demonstration of technical skills and knowledge necessary to perform DNA testing successfully.

3.2

competency test(s)

Test(s) designed to establish that an individual has achieved technical skills and knowledge necessary to perform independent DNA testing.

3.3

DNA technical leader

(or equivalent role, position, or title as designated by the laboratory director)

An employee who is accountable for the technical operations of the DNA laboratory and who is authorized to stop or suspend DNA laboratory operations.

3.4

DNA testing

The application of molecular laboratory techniques, data analysis, interpretation and comparison, statistical evaluation, database searching, reporting, and testimony to biological samples.

3.5

method

A combination of procedural steps used to perform a specific technical process.

3.6

platform

A type of analytical system utilized to generate DNA profiles.

3.7

procedure

(protocol, standard operating procedure, or equivalent)

A series of instructions to be followed in performing a specified task or under specific circumstances.

3.8**qualified individual**

An individual who has successfully completed the laboratory's applicable training requirements and is authorized to perform a specific task or role. In addition, the individual is required to participate in the laboratory's proficiency testing program.

3.9**technology**

The type of DNA testing performed in the laboratory, such as single nucleotide polymorphism (SNP), short tandem repeats (STR), Y-chromosome STR (Y-STR), or mitochondrial DNA (mito, mtDNA).

3.10**training program**

A written description of activities to be performed for the purpose of establishing competency in job-related knowledge, skills, and abilities.

3.11**validation**

The process of performing a set of experiments that establish the efficacy, reliability, and limitations of a method, procedure, or modification thereof; this includes developmental and/or internal validation.

4 Requirements**4.1 Personnel****4.1.1 General**

All DNA laboratory personnel shall successfully complete training prior to independently participating in any aspect of DNA testing.

4.1.2 DNA Technical Leader

4.1.2.1 The DNA technical leader shall be responsible for managing the training program.

NOTE The training program encompasses the content of the training manual, the qualifications of assigned personnel, and the training activities assigned to individual trainees.

4.1.2.2 The DNA technical leader shall determine which portions of the training program are assigned based on the trainee's previous experience (if applicable), expected job responsibilities, and participation in the validation of a method (if applicable).

4.1.3 Training Program Coordinator

4.1.3.1 The laboratory or laboratory system shall have an individual who executes the DNA training program of individual trainees under the direction of the DNA technical leader.

4.1.3.2 The training program coordinator shall be responsible for determining eligibility of laboratory trainers.

NOTE The training program coordinator may be the DNA technical leader or their designee.

4.1.4 Laboratory Trainers

Laboratory trainers shall be currently or previously qualified in the methods and/or technologies they are assigned to train.

NOTE If individuals who are involved in the validation studies of a new DNA processing, data analysis, interpretation and comparison, or statistical evaluation method are exempted from all or portions of the assigned training activities and deemed qualified by the DNA technical leader, they may be designated as laboratory trainers.

4.1.5 Individual Trainees

4.1.5.1 Trainees shall meet the educational requirements set by the laboratory.

4.1.5.2 Inexperienced personnel entering the laboratory's training program shall complete all training activities for each assigned portion of the training program.

4.1.5.3 Personnel entering the laboratory's training program with experience in DNA testing shall have records of previous training and competency activities.

4.1.5.3.1 Prior to training, experienced personnel shall complete an evaluation of knowledge and skill as designed by the laboratory.

4.1.5.3.2 The DNA technical leader shall assess the expertise of personnel with previous DNA experience based on the provided records and their performance on the knowledge and skill evaluation.

NOTE Individuals with documented previous training and experience in DNA testing and satisfactory performance on any or all portions of the knowledge and skill evaluation may be exempted by the DNA technical leader from portions of the laboratory's training program.

4.1.5.4 All personnel responsible for performing a DNA processing, data analysis, interpretation and comparison, or statistical evaluation method that is newly incorporated into the laboratory's procedures shall successfully complete training and competency testing prior to independently performing the new method.

4.2 Training Program

4.2.1 General

4.2.1.1 The laboratory shall have a written training program that encompasses the knowledge, technical training, and practical experience required to independently perform assigned DNA testing responsibilities.

4.2.1.2 Prior to implementation, the DNA training program shall be approved by the DNA technical leader and any management staff required by laboratory policy.

4.2.2 Content

4.2.2.1 The training program shall include expectations for satisfactory progression through the training activities and performance on all competency tests.

4.2.2.2 The training program shall include the topics listed in Table 1 as they apply to DNA testing conducted by the laboratory and assigned to the individual in training:

Table 1—Training Topics

	Topic	Laboratory Document Review	Literature Review	Instruction	Observation	Practical Exercise
A	General operation of the forensic laboratory	x		x		
B	Laboratory quality management program	x		x		
C	Laboratory safety program	x		x		
D	Evidence handling and chain of custody	x	x	x	x	x
E	Human factors and bias	x	x	x		
F	Ethical and professional guidelines and codes of conduct	x	x	x		
G	Validation studies supporting methods used in the DNA laboratory	x	x	x		
H	Theoretical and scientific basis of DNA testing		x	x		
I	Technologies, methods, and platforms (and associated software) used in the laboratory	x	x	x	x	x
J	Data analysis, interpretation, comparison, and statistical evaluation	x	x	x	x	x
K	Limitation of methods, selection of methods	x	x	x		
L	Report writing	x		x	x	x
M	Technical and administrative reviews	x		x	x	x
N	Purpose, use, and eligibility of DNA databases (e.g., quality, CODIS)	x	x	x	x	
O	Applicable laws and regulations	x	x	x		
P	Expert witness testimony		x	x	x	x

NOTE Details of each required topic in the table are found in the associated subject-specific training standards (e.g., ANSI/ASB Standard 023, *Standard for Training in DNA Isolation and Purification Methods*).

4.2.3 Administration of the Training Program

4.2.3.1 Internal training shall be performed by one or more laboratory trainers designated by the training program coordinator.

4.2.3.2 External training content shall be reviewed and pre-approved by the DNA technical leader prior to assignment to a trainee.

4.2.4 Documentation of Assigned Portions of the Training Program

4.2.4.1 The training program shall be tailored, as applicable, to the trainee's specific job responsibilities, previous experience (if applicable), and the extent to which the trainee will participate in DNA testing.

4.2.4.2 The DNA technical leader shall document which portions of the training program are assigned to the trainee based on previous experience (if applicable) and an evaluation of initial knowledge and skill relating to the trainee's intended job responsibilities.

4.2.4.3 External training activities and the prior approval of external training content shall be documented in the trainee's records.

4.2.4.4 The DNA technical leader shall document the involvement of a trainee in the validation studies of a new DNA processing, data analysis, interpretation and comparison, or statistical evaluation method and indicate whether the trainee has achieved sufficient knowledge and skill to be exempted from all or portions of the training activities.

4.2.5 Re-training of Laboratory Personnel

4.2.5.1 If a currently qualified individual requires re-training, the DNA technical leader shall evaluate the circumstances and determine the appropriate knowledge-based or technical activities and associated competency testing to be completed.

NOTE Re-training may be required when the DNA testing skills of an individual need to be re-established (e.g., extended employment leave, temporary job re-assignment) or remediated (e.g., corrective action, performance improvement).

4.2.5.2 Re-training activities shall be administered and documented in the same manner as initial training, as described in 4.2.3 and 4.2.4.

4.2.6 Review and Revisions to the DNA Training Program

4.2.6.1 The DNA training program shall be reviewed by the DNA technical leader annually.

4.2.6.2 Revisions to the DNA training program shall be approved by the DNA technical leader and any management staff required by laboratory policy, prior to implementation by the laboratory.

4.2.6.3 New DNA processing, data analysis, interpretation and comparison, or statistical evaluation methods approved and implemented by the laboratory shall be incorporated into the laboratory's training manual prior to training personnel in the new method.

4.3 Competency Testing

4.3.1 General

The assigned competency testing shall be based on the individual's job responsibilities and the extent to which they will participate in DNA testing.

NOTE The goal of competency testing is to establish that the trainee has the knowledge, skill, and ability required to perform the assigned job responsibilities.

4.3.2 Required Testing

4.3.2.1 The format of the competency testing shall be based on the training topic as outlined in Table 2.

4.3.2.2 Written knowledge-based tests shall be designed to demonstrate the trainee's comprehension of the topic.

4.3.2.3 Oral knowledge-based tests shall be designed to demonstrate the trainee's ability to explain the topic to a layman and to a scientific expert.

4.3.2.4 Practical tests shall be designed to demonstrate the trainee's skill in performing a task related to the topic and obtaining the expected result.

4.3.2.5 A mock trial shall serve to demonstrate the trainee's composure in an adversarial court setting, adherence to courtroom rules, ability to listen and accurately respond to questions by all parties, skill in communicating complex information, and ability to clearly articulate the limitations of their expertise as well as the methods used.

Table 2—Competency Test Format per Training Topic

	Topic	Written and/or Oral Test	Practical Test	Mock Trial
A	Quality assurance	x	x	x
B	Cognitive bias	x		x
C	Ethics	x		x
D	Validation	x		x
E	Theoretical and scientific foundation	x		x
F	DNA processing methods	x	x	x
G	Data analysis	x	x	x
H	Interpretation and comparison	x	x	x
I	Statistical evaluation	x	x	x
J	Report writing	x	x	x
K	Technical review	x	x	
L	DNA databases (e.g., quality, CODIS)	x	x	
M	Applicable laws and regulations	x		x
N	Testimony	x		x

4.3.3 Administration of Competency Tests

Competency tests shall be assembled, issued, and assessed internally.

NOTE 1 Competency tests may be administered as individual tests for each assigned area or topic of the training program or combined into more comprehensive tests.

NOTE 2 The DNA technical leader may allow participation in a validation project to serve as the competency test for DNA personnel who had an integral role in the project sufficient to master the technical skills, concepts, and knowledge pertaining to the method.

4.3.4 Assessment of Competency

4.3.4.1 The laboratory shall establish written criteria for satisfactory completion of each competency test.

4.3.4.2 The DNA technical leader shall evaluate and document the results of all competency tests.

4.3.4.3 All competency tests shall be graded as either satisfactory or unsatisfactory according to the criteria established in 4.3.4.1.

4.3.4.4 Competency test results shall be reviewed with the trainee, the trainer(s), and the trainee's supervisor.

4.3.4.5 If an individual has an unsatisfactory result on a competency test, the DNA technical leader shall issue a new test tailored to the specific knowledge or skill to be addressed.

4.3.5 Acknowledgement of Competency

4.3.5.1 Prior to the trainee performing independent DNA testing, the DNA technical leader shall document that the trainee has successfully completed the assigned competency testing.

4.3.5.2 Based upon the DNA technical leader's documented approval, the laboratory shall authorize the individual to independently perform the assigned DNA testing task(s).

5 Conformance

To demonstrate conformance with this standard, the laboratory shall have:

a) a documented training program, which includes:

1) a written training manual covering all validated technologies and methods currently used by the laboratory as well as all the DNA testing procedures to be performed by laboratory personnel, and

2) expectations of the knowledge and technical skills required to perform DNA testing;

b) documented review and approval of the training program by the DNA technical leader and any other laboratory management staff as required by laboratory policy prior to implementation by the laboratory;

- 203 c) records of successful completion of training activities (including re-training) and competency
204 test(s) for each trainee prior to performing independent DNA testing;
- 205 1) specific records as to the individual's job responsibilities and the extent to which they will
206 participate in DNA testing, and
- 207 2) include in the record any modifications made to the individual's training program and
208 documented approval of the modifications by the DNA technical leader;
- 209 d) documented review and approval of the training records for completeness by the DNA technical
210 leader and laboratory management, as applicable;
- 211 e) documented acknowledgement from the DNA technical leader that each individual has
212 demonstrated the knowledge, skills, and ability to perform the assigned job responsibilities as
213 they apply to DNA testing; and
- 214 f) a retention practice for records of all training activities and competency testing for each trainee
215 according to the laboratory or greater agency's policy.

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Annex A (informative)

Bibliography

The following bibliography is not intended to be an all-inclusive list, review, or endorsement of literature on this topic. The goal of the bibliography is to provide publications cited informationally and publications relevant to the standard. For undated references, the latest edition of the referenced document (including any amendments) applies.

- 1] FBI, *Quality Assurance Standards for DNA Databasing Laboratories*.^a
- 2] FBI, *Quality Assurance Standards for Forensic DNA Testing Laboratories*.^a
- 3] SWGDAM. *SWGDAM Training Guidelines*.^a
- 4] ANSI/ASB Standard 023, *Standard for Training in Forensic DNA Isolation and Purification Methods*.^b
- 5] ANSI/ASB Standard 078, *Standard for Training in Forensic Autosomal STR and YSTR DNA Interpretation and Comparison*.^b
- 6] ANSI/ASB Standard 079, *Standard for Training in the Use of Combined DNA Index System (CODIS)*.^b
- 7] ANSI/ASB Standard 080, *Standard for Training in Forensic DNA Reporting and Review*.^b
- 8] ANSI/ASB Standard 081, *Standard for Training in Statistical Calculations Used for Forensic STR DNA Data*.^b
- 9] ANSI/ASB Standard 091, *Standard for Training in Analysis of Forensic Short Tandem Repeat (STR) DNA Data*.^b
- 10] ANSI/ASB Standard 115, *Standard for Training in Forensic Short Tandem Repeat Typing Methods Using Amplification, DNA Separation, and Allele Detection*.^b
- 11] ANSI/ASB Standard 116, *Standard for Training in Forensic DNA Quantification Methods*.^b
- 12] ANSI/ASB Standard 123, *Standard for Routine Internal Evaluation of a Laboratory's DNA Interpretation and Comparison Protocol*.^b
- 13] ANSI/ASB Standard 130, *Standard for Training in Forensic DNA Amplification Methods for Subsequent Capillary Electrophoresis Sequencing*.^b
- 14] ANSI/ASB Standard 131, *Standard for Training in Forensic DNA Sequencing Using Capillary Electrophoresis*.^b

^a Available from: [https://www.swgdam.org/publications \[swgdam.org\]](https://www.swgdam.org/publications [swgdam.org])

^b Available from: <https://www.aafs.org/aafs-standards-board>

248 15] ANSI/ASB Standard 140, *Standard for Training in Forensic Human Mitochondrial DNA Analysis,*
249 *Interpretation, Comparison, Statistical Evaluation, and Reporting.*^b

250 16] ANSI/ASB Standard 154, *Standard for Training on Testimony for Forensic Biology.*^b

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