

DNA Analyst Training Laboratory Training Manual

User Guide



PRESIDENT'S
DNA
INITIATIVE



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Introduction

One of the main goals of the President's DNA Initiative is to provide basic and advanced training about the use of forensic DNA. The "DNA Analyst Training" is one of several trainings funded by the President's DNA Initiative. Other trainings discuss theory and forensic issues that form the foundation of an analyst's practical work. All trainings are available on www.DNA.gov.

This Laboratory Training Manual is both (1) a complement to the instruction available from the President's DNA Initiative and (2) a standalone resource for laboratories with established training programs. The Manual gives examples of methods used in forensic laboratories, but it is not intended to cover all methods.

The Laboratory Training Manual is not suitable for self-directed learning; it is a tool in the partnership between the trainer and the trainee. The trainer may be a member of the laboratory staff, college faculty member, or a contractor.

Laboratories must arrange access to facilities for the practical exercises. Arrangements can be made in several ways:

- By individual laboratory
- Through regional cooperation of several laboratories
- Through partnership with a local training institution

Note: Allow at least eight weeks before the training to set up and conduct a preliminary run through. If the training is outsourced, identify the training partner and provide them with the Laboratory Training Manual in advance.

A laboratory's DNA Technical Leader has responsibilities under the National Quality Assurance Standards for DNA Testing (QAS). These include oversight of DNA training programs and approval and documentation of analyst qualifications prior to independent casework. This program is set up to foster a close working relationship between the DNA Technical Leader and trainee.

The DNA Technical Leader is responsible for:

- Meeting with the student, developing an Individual Training Plan, and setting target dates for completion
- Preparing students for the Demonstration of Competency
- Evaluating a student's progress

Students must demonstrate practical competency to the satisfaction of the Technical Leader by completing the practical exercises outlined in the Individual Training Plan. The Laboratory Training Manual includes review questions to facilitate discussion between the student and the Technical Leader.

The specific requirements outlined for DNA analyst training in the QAS include the laboratory's responsibility to:

- Establish and document a training program that coincides with the procedures used in their facility
- Establish, maintain, and make available for review training records for each trainee
- Establish training records that document a formal recognition of a trainee's successful completion of the training program

The Laboratory Training Manual uses the [Scientific Working Group on DNA Analysis Methods \(SWGDM\) Training Guidelines](#) as a reference for establishing a training program. The manual provides a minimum benchmark for laboratories; the laboratory may add exercises as prescribed by their procedures and policies.

The SWGDAM Training Guidelines recommend that laboratory training programs, at a minimum, address the following:

- Evidence handling
- Foundational scientific knowledge
- Applied scientific knowledge
- Laboratory analysis
- Report writing
- Legal issues
- Final evaluation

Structure of the Laboratory Training Manual

The Laboratory Training Manual consists of:

1. The Laboratory Training Manual User Guide. This guide discusses trainer and trainee responsibilities and contains the laboratory exercises and related documents. It is recommended that first-time users of the Laboratory Training Manual review all program documents.
2. A set of Linked Documents, which contains folders covering:

Folder Name	Contents
Laboratory Exercises	Laboratory exercises are presented by subject for the areas that require practical exercises. Review questions are included to facilitate discussion.
Sample Protocols	The Laboratory Training Manual assumes that the protocols in the laboratory's SOPs will be used for the practical exercises. Protocols for the exercises are included in the manual for facilities that wish to use them. Sample protocols are numbered and linked from the Laboratory Training Manual content for easy reference by the trainee. A table of all protocols is available in this User Guide for easy access to all provided protocols.
Literature Resources	Literature resources are provided for the subjects covered in the manual. The resources are organized by category/topic and may cover additional topics. The listing may include works already listed in the Works Cited section of the PDI knowledge base. A link to this global document is provided at the end of this document and at the beginning of each subject laboratory component.
Sample Forms	Sample forms for an <i>Individual Training Plan</i> and a <i>Demonstration of Competency</i> are provided. The forms are designed to assist the Trainer and Trainee to develop a training plan that incorporates the laboratory's SOPs. The trainee completes the practical exercises outlined in the Individual Training Plan form and the trainer/technical leader approves successful completion.

Laboratory Policies and Procedures

Trainer Responsibilities

1. Provide trainee with the appropriate laboratory SOPs, quality system manuals, and safety system manuals
2. Provide trainees with instruction regarding the various services (disciplines) offered by the laboratory and the laboratory's specific evidence handling guidelines (not included in this manual)
3. Determine the assessment criteria for the trainee
4. Review, verify, and document assignment completion

Trainee Responsibilities

1. Read all of the appropriate laboratory SOPs, quality system manuals, and safety system manuals
2. Complete instruction regarding the various services (disciplines) offered by the laboratory and the laboratory's specific evidence handling guidelines (not included in this manual)
3. Document and submit assignment completion as required by the trainer

Protocols

Practical exercises were developed for use this training. The expectation is that the trainee will use their laboratory's established protocols (SOPs) upon return to their workplace.

There may be instances when the laboratory does not have an SOP for one or more method and could use the provided protocols. Most of these have been based on SOPs used by the Illinois State Police (ISP). *This is not an endorsement by ISP of this training nor is it an endorsement by the NFSTC of the ISP protocols.* However, the SOPs are from a well-established operational laboratory that has successfully completed many cycles of accreditation and other review. These SOPs were successfully transferred by the NFSTC into a training environment when a face-to-face version of the DNA analyst training was provided to a group of ISP staff.

Trainer Responsibilities

1. Provide trainee with the laboratory's SOP's (protocols)
2. Determine the assessment criteria
3. Review, verify, and document assignment completion

Trainee Responsibilities

1. Read all of the required protocols, as assigned by the laboratory trainer
2. Document and submit assignment completion as required by the trainer

Literature Resources

The literature resources are provided in a global document that is organized by category. A link to the Literature Resource document is provided at the end of this User Guide and at the beginning of each subject laboratory component. Revisions to the Literature Resource document should be made if the trainee's laboratory resource requirements vary from those provided in the Laboratory Training Manual.

Trainer Responsibilities

1. Provide trainee with the laboratory's required reading material (journals, textbooks, product literature, manufacturer training references, user manuals, Internet resources)
2. Determine the assessment criteria
3. Review, verify, and document assignment completion

Trainee Responsibilities

1. Read all of the required readings as assigned by the laboratory trainer
2. Document and submit assignment completion as required by the trainer

Forms

Individual Training Plan

An integral part of the DNA Analyst Training program is the establishment of an Individual Training Plan. The plan provides the trainee with the training expectations and a means for documenting completion of the program.

The trainer and trainee should both participate in the preparation of the Individual Training Plan to ensure that both parties understand their respective duties. The training plan should include established methods for evaluation.

Suggested evaluation methods include the following:

- Summary of the trainee's progress for each exercise
- Evaluation of the trainee's notebook for each exercise
- Documentation of problem areas, as applicable, and their solutions or proposed solutions
- Documentation of trainee's strengths and weaknesses, including suggested remedies
- Documentation of trainee's overall performance

The laboratory protocols provided in this manual are examples of frequently used procedures. These protocols may be useful for laboratories that do not currently have established processes or laboratories that may wish to implement them in addition to their existing procedures.

Each laboratory must demonstrate that analysts are trained in the procedures used by that laboratory. The Individual Training Plan must include the specific laboratory protocols for the trainee to follow.

The training plan can be adapted for trainees with previous experience who may not need to complete the full scope required of a new DNA analyst trainee.

Demonstration of Competency

Upon completion of the training plan elements, the trainer will complete the trainee's Demonstration of Competency record. The DNA Technical Leader is responsible for verification and final approval.

Trainer Responsibilities

1. Establish and document the training plan for each trainee
2. Determine and document the training plan evaluation methods and assessment criteria
3. Provide trainee with the appropriate laboratory protocols
4. Ensure that the trainee's notebook is reviewed regularly by the DNA Technical Leader and/or designee
5. Review, verify, and document exercise completion

Trainee Responsibilities

1. Review and understand the training plan, evaluation methods, and assessment criteria
2. Read the appropriate laboratory protocols
3. Perform the exercises outlined in the training plan
4. Maintain a notebook to include notes, photographs, worksheets, print-outs of quantitative data, genotyping for each sample, problems/ solutions, etc.
5. Document and submit assignment completion as outlined in the training plan

Navigation of the Laboratory Training Manual

The Laboratory Training Manual User Guide contains a listing of exercises and protocols (by subject), literature, and forms that are hyperlinked to the related documents.

A hyperlink at the end of each document returns the user to the Laboratory Training Manual User Guide, enabling the user to proceed easily through the entire set of documents.

Links to additional material are found within the exercises allowing access to related external Internet resources.

Using Hyperlinks

Definition: A hyperlink is an element within a document that, when clicked with the mouse, takes the user to a place in a document, on the Internet, or on an Intranet.

Depending on how the computer is setup, the user may use a hyperlink by simply clicking on the hyperlink with the mouse or by holding down the Control key while clicking on the hyperlink with the mouse.

The various documents may be selected and opened by clicking on hyperlinks displayed in [blue, underlined text](#). The selected document then opens in a separate window for review or print. Unless the hyperlinked, opened document is closed, a potentially large number of documents could be open at one time. This may slow the processing ability of the computer. It is recommended that users close documents as they are finished with them.

Links to Laboratory Exercises

<i>Subject</i>	<i>Laboratory Exercises</i>
Subject 1: Evidence and DNA	Laboratory Exercises
Subject 2: Forensic Biology	Laboratory Exercises
Subject 3: DNA Extraction and Quantitation	Laboratory Exercises
Subject 4: DNA Amplification	Laboratory Exercises
Subject 5: Amplified DNA Product Separation	Laboratory Exercises
Subject 6: STR Data Analysis and Interpretation	Laboratory Exercises
Subject 7: Population Genetics and Statistics	Laboratory Exercises
Subject 8: Communicating Results	Laboratory Exercises
Subject 9: Other Nuclear DNA Markers & Technology	No Laboratory Exercises

Links to Sample Protocols

Subject	Topic	Protocol	File Link
1	Evidence and DNA	No applicable protocols; procedures are determined by each laboratory's evidence collection and handling policy/procedures	Not applicable
Subject	Topic	Protocol	File Link
2	Laboratory Orientation	Quality Assurance	pdi lab_pro 2.01.pdf
2	Laboratory Orientation	Clean Technique	pdi lab_pro 2.02.pdf
2	Basic Biology & Testing of Bodily Fluids & Tissues	Semen Stain Identification: Acid Phosphatase Presumptive Chemical Test (Indication)	pdi lab_pro 2.03.pdf
2	Basic Biology & Testing of Bodily Fluids & Tissues	Semen Stain Identification: Acid Phosphatase Mapping (Indication)	pdi lab_pro 2.04.pdf
2	Basic Biology & Testing of Bodily Fluids & Tissues	Semen Stain Identification: Kernechtrot Picoindigocarmine Stain (KPIC) (Identification)	pdi lab_pro 2.05.pdf
2	Basic Biology & Testing of Bodily Fluids & Tissues	Semen Stain Identification: P30 Analysis by ABACard (Identification)	pdi lab_pro 2.06.pdf
2	Basic Biology & Testing of Bodily Fluids & Tissues	Vaginal Secretion Indication: Lugol's Stain	pdi lab_pro 2.07.pdf
2	Basic Biology & Testing of Bodily Fluids & Tissues	Saliva Stain Indication: Phadebas Test	pdi lab_pro 2.08.pdf
2	Basic Biology & Testing of Bodily Fluids & Tissues	Saliva Stain Indication: Radial Gel Diffusion Test	pdi lab_pro 2.09.pdf
2	Basic Biology & Testing of Bodily Fluids & Tissues	Saliva Stain Indication: Amylase Mapping	pdi lab_pro 2.10.pdf
2	Basic Biology & Testing of Bodily Fluids & Tissues	SALIGaE® Test for the Presence of Saliva	pdi lab_pro 2.11.pdf
2	Basic Biology & Testing of Bodily Fluids & Tissues	Urine Stain Indication: Creatinine Test	pdi lab_pro 2.12.pdf
2	Basic Biology & Testing of Bodily Fluids & Tissues	Fecal Matter Indication: Urobilinogen	pdi lab_pro 2.13.pdf

Subject	Topic	Protocol	File Link
2	Basic Biology & Testing of Bodily Fluids & Tissues	Bloodstain Indication: Luminol Test	pdi lab pro 2.14.pdf
2	Basic Biology & Testing of Bodily Fluids & Tissues	Bloodstain Indication: Kastle-Meyer Test	pdi lab pro 2.15.pdf
2	Basic Biology & Testing of Bodily Fluids & Tissues	Bloodstain Indication: Ouchterlony Test	pdi lab pro 2.16.pdf
2	Basic Biology & Testing of Bodily Fluids & Tissues	Hemastix Presumptive Test for Blood	pdi lab pro 2.17.pdf
2	Basic Biology & Testing of Bodily Fluids & Tissues	Leucomalachite Green Presumptive Test for Blood	pdi lab pro 2.18.pdf
2	Basic Biology & Testing of Bodily Fluids & Tissues	Tetramethylbenzidine Presumptive Test for Blood	pdi lab pro 2.19.pdf
2	Basic Biology & Testing of Bodily Fluids & Tissues	ABAcad® Hematrace® Test for the Identification of Human Hemoglobin	pdi lab pro 2.20.pdf
2	Basic Biology & Testing of Bodily Fluids & Tissues	Evaluation of Hair for DNA Analysis	pdi lab pro 2.21.pdf
2	Basic Biology & Testing of Bodily Fluids & Tissues	Flowchart for Analysis of Potential Semen Stains	pdi lab pro 2.22.pdf
Subject	Topic	Protocol	File Link
3	Extraction- DNA Analysis Considerations	DNA Isolation: General Information on DNA Isolation	pdi lab pro 3.01.pdf
3	Organic Extraction	DNA Isolation: Differential Isolation of DNA from Semen Stains	pdi lab pro 3.02.pdf
3	Organic Extraction	DNA Isolation: Isolation of DNA from Non-Semen Samples	pdi lab pro 3.03.pdf
3	Organic Extraction	DNA Isolation: Isolation of DNA from Bone	pdi lab pro 3.04.pdf
3	Quantitation	Chelex® 100 Non-Differential Extraction	pdi lab pro 3.05.pdf
3	Quantitation	Chelex® 100 Differential Extraction	pdi lab pro 3.06.pdf
3	Quantitation	Slot Blot (Chemiluminescence)	pdi lab pro 3.07.pdf

Subject	Topic	Protocol	File Link
3	Quantitation	Slot Blot Worksheet	pdi lab pro 3.08.pdf
3	Quantitation	Slot Blot Colorimetric Procedure	pdi lab pro 3.09.pdf
3	Quantitation	Slot Blot Colorimetric Worksheet	pdi lab pro 3.10.pdf
3	Quantitation	Quantifiler Quantitation Procedure	pdi lab pro 3.11.pdf
Subject	Topic	Protocol	File Link
4	Multiplexing	PCR: Amplification and Electrophoresis of STRs	pdi lab pro 4.01.pdf
4	Multiplexing	Worksheet	pdi lab pro 4.02.pdf
Subject	Topic	Protocol	File Link
5	Sample Prep & Handling	Calculations and Dilutions Procedure	pdi lab pro 5.01.pdf
5	Capillary Electrophoresis	PCR: Amplification and Electrophoresis of STRs	pdi lab pro 5.02.pdf
5	Amplification Setup	Amplification Setup: Worksheet	pdi lab pro 5.03.pdf
Subject	Topic	Protocol	File Link
6	STR Data Analysis & Interpretation Software	PCR: Amplification and Electrophoresis of STRs	pdi lab pro 6.01.pdf
6	Data Interpretation & Allele Calls	PCR: Interpretation	pdi lab pro 6.02.pdf
Subject	Topic	Protocol	File Link
7	Statistics	Interpretation	pdi lab pro 7.01.pdf
7	Statistics	Allele Frequency Data	pdi lab pro 7.02.pdf
Subject	Topic	Protocol	File Link
8	Report Writing	Forensic Biology Report Wording	pdi lab pro 8.01.pdf
8	Report Writing	DNA Report Wording	pdi lab pro 8.02.pdf
8	Report Writing	Worksheets	pdi lab pro 8.03.pdf
8	Report Writing	Technical Review	pdi lab pro 8.04.pdf

Link to [Literature Resources](#)

Links to Sample Forms

- [Individual Training Plan](#)
- [Demonstration of Competency](#)