

FORENSIC BIOLOGY TRAINING MANUAL

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**TRAINING MANUAL
VERSION 2.0**

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APPROVED BY			
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1. INTRODUCTION		
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The purpose of the training program is to prepare new analysts with the theoretical and practical means necessary to perform reliable testing. For interpreting job titles, this includes training to learn how to present this information competently in court. By having a multi-phase program of practical exercises, written assignments, and oral examinations, an analyst's weak points should become obvious, and the staff can work with the analyst to bolster this aspect of his/her knowledge and competency.

Newly hired staff are trained to perform a variety of different procedures, each relating to analyzing physical evidence for DNA typing. Each trainee progresses through a series of training modules in sequence; the modules correspond to duty rotations in the laboratory: evidence examination, sexual assault kit processing, exemplar processing, Chelex extraction, QuantiBlot, and PCR amplification and typing. The modules selected depend on the job title of the trainee. Completion of the complete set of required modules is necessary for a trainee to become an interpreting analyst.

During training periods, staff will be required to spend all of their time in training. This means that flexible or compressed time schedules, attendance at professional meetings, and participation in special projects (such as FARU) will not generally be allowed.

In total, the training will cover the theoretical and practical aspects of forensic biology. In particular it covers aspects of molecular biology, separation technology, interpretation of complex DNA results, and statistical concepts as they relate to forensic DNA analysis

A. Training – evidence examination and serological methods

The goal of training and competency testing in the classical forensic biology methods is to establish consistency of performance between individual analysts and to maintain the highest possible level of performance over time. These analytical procedures for identifying physiological fluids are the foundation on which further individualization (DNA testing) is based, and their behavior and limitations must be understood.

The classical forensic biology training program is monitored by the Director, Deputy Director, Assistant Directors, and/or Criminalist III/IV supervisors. The training may be performed by any Criminalist II or higher who is competent and has the appropriate level of experience (generally, at least six months completed past the training period for the specific procedure).

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A Criminalist may interpret and write reports for negative blood cases, negative semen cases, semen-only cases, and species-determination cases as soon as they have successfully completed the appropriate competency tests.

B. Training - DNA analysis

The goal of training and competency testing in the DNA laboratory is to establish consistency of performance throughout the laboratory and to maintain the highest possible level of performance over time.

The DNA training program is monitored by the Director, Deputy Director, Assistant Directors, and/or Criminalist III/IV supervisors. The training may be performed by any Criminalist II or higher who is competent and has the appropriate level of experience (generally, at least six months completed part the training period for the specific procedure).

The trainee may not interpret DNA results (STR CE processing and signing DNA reports) until they become a DNA interpreting analyst: completed all training modules (except DNA mock court), all three classes, population statistics, six months DNA lab experience, and successful completion of a DNA competency test. They will be expected to manage their DNA cases and write DNA reports for their supervisor's signature in the interim.

If any new or additional federal and/or state requirements are imposed, they must be met prior to interpreting DNA results.

Failure to satisfactorily complete competency tests, written or oral examinations, mock courts, required courses, or other required training activities, within a reasonable time frame after the beginning of training, may constitute grounds for demotion or termination.

C. Training folder

The training is documented in a training folder. This contains records (notes, worksheets, photographs, etc.) generated during training. In addition, for each topic the date and initials of the trainer should be noted. The supervisor should regularly review the contents of the training folder for accuracy and completeness.

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D. Training schedule

A training schedule must be provided to each trainee and all scientific staff responsible for any aspect of the training. Because the training schedule affects many aspects of department operations, it should be adhered to as carefully as possible. Each module has adequate time allotted for the training. If necessary, for example if equipment is unavailable, a trainee may be asked to substitute a weekend day for a week day.

For Lab Associates and Criminalist I's, the training is limited. As competency is obtained in each module, the trainee normally then is assigned to a one to two week assignment in that rotation performing analysis on casework samples.

For Criminalist II's and above, the training continues non-stop. Once all required training modules are complete, the trainee joins the rotation schedule.

E. Roles and responsibilities

Training Group	<p>The training group is responsible for periodic review and/or revision of the Training Manual and reference binder.</p> <p>The training group is responsible for preparation of training schedules, training assignments, and training folders. This includes scheduling of training given by OCME staff other than those from the Department of Forensic Biology.</p> <p>The training group is responsible for ensuring that practice samples and competency test samples are prepared.</p> <p>The training group is responsible for ensuring that reference binders and manuals are available.</p>
Trainee	<p>The trainee is expected to be ready to go by 9 am each day there is directly supervised training (observation or demonstration of a technique). On days where the trainee is working on practical exercises, practice samples, or competency tests there may be more flexibility.</p>

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The trainee is expected to do the required readings and be prepared to answer questions from the trainer or their supervisor on the topics as they are covered.

The trainee is expected to work on and complete the written questions during the time period of the training module and/or lecture. They should not be postponed until the end of hands-on training.

Trainer

The trainer is expected to be ready to go by 9 am each day there is directly supervised training (observation or demonstration of a technique). The trainer must realize that training has the priority; meetings or other tasks may have to be postponed. *If the assigned trainer finds he/she is unavoidably unable to perform the training, they must make arrangements for the training to be re-assigned.*

The trainer is responsible for reinforcing the information from the required reading and lectures by discussing each technique in detail during the training, including theoretical and practical aspects.

The trainer must be available for questions on other days allocated for the module.

The trainer must review any paperwork generated during the demonstration of a technique by a trainee; the review should include checking for completeness and accuracy.

Supervisor

The direct supervisor of the trainee has the primary responsibility for the monitoring of the training process. The supervisor must plan on regularly spending time with the trainee, including:

- Discussing the topics covered by the required reading.
- Reviewing the answers to the written questions.
- Reviewing the training folder for completeness and accuracy.
- Determining the successful completion of competency tests.

Regular weekly or biweekly meeting at the end of each training module is expected.

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The direct supervisor is responsible for helping the trainees choose cases for serology and DNA mock court, acting as prosecutor, and preparing them for testimony.

Technical Leader

The technical leader is responsible for final determination of the readiness of the trainee to enter the rotation. This includes:

- Final review of the training folder, including review of competency tests as needed.
- Final review of the answers to the written questions.
- Evaluation of the oral examination, including any needed remediation.
- Determination of satisfaction of state and/or federal requirements, including review of college transcripts, course syllabi, and/or textbooks as needed.

The technical leader is responsible for issuing the written notification of completion of training and the written notification of achievement of interpreting analyst status.

F. First day procedures

In order to allow new employees to function in the Department of Forensic Biology as efficiently as possible the following procedures should be followed on their first day of employment.

On new employees' first day:

1. E-mail and computer accounts should be requested for each new employee.
2. Add all names to key log
3. Add all names to FB staff directory
4. Request transcripts.
5. Add Criminalist II and above names to testimony database.
6. Add all names to continuing education database
7. Obtain two (2) buccal swabs from each new employee for DNA STR typing and Mitochondrial DNA Analysis

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2. GENERAL GUIDELINES		
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A. Theoretical background

In addition to requiring a minimum educational background for the job title(s), the Department provides additional theoretical background necessary for trainees to understand the scientific basis behind each analytical test. This training takes place over a number of weeks through the required lectures and reading assignments. Most lectures are also available as computer presentations maintained in the departmental directory.

Each member of the scientific staff has access to literature references and reference books that the department maintains; methods manuals used in the laboratory contain bibliographies listing references in the scientific literature. Copies of publications pertaining to in-house methods are given to each trainee in the form of a Reference Binder. Additionally, OCME professional staff has library and Internet privileges at the New York University Medical School library located next door to the OCME.

B. Practical experience

Each analyst will be trained to perform the analytical procedures that are appropriate to that job title. All practical training has two phases: the trainee observes the procedure being done; the trainee uses practice specimens to demonstrate the procedure to the trainer until it is determined that the trainee can use the procedure independently.

C. Competency testing

At the conclusion of training in any particular analytical procedure, the trainee will be asked to successfully complete a competency test using that procedure. In general, a competency test is prepared in-house with the key to the results being supplied to the supervisor, Assistant Directors, Technical Leader, and/or Director.

D. Written assignments and oral examination

New scientific staff (Lab Associates and above) must take and pass the written assignment (if applicable) for each module taken. New scientific staff (Criminalist II and above) must take an oral examination covering several areas of DNA theory and analysis before using DNA procedures in casework.

The written assignment is reviewed by the supervisor and Technical Leader.

The oral examination is attended by the supervisor, appropriate Assistant Director, and the Technical Leader and/or Training Coordinator.

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E. Court preparation

An important part of training is learning to present scientific information in court. There are several ways to prepare trainees for court and public speaking: accompanying laboratory personnel to court and observing testimony, as well as attending pre-trial conferences at the laboratory.

Before testifying in court or grand jury, new staff must participate in a moot/mock court conducted by supervisory scientific staff; non-scientific people may also be present. The purpose of the moot/mock court is to give the analyst an introduction to the adversary process and to practice for actual testimony in a trial or grand jury. It is also a mechanism for the supervisory staff to identify and correct obvious problems the analyst may have in his/her knowledge or ability to communicate effectively. After the moot court, constructive criticism of the trainee's mock testimony is given, and, if needed, specific suggestions for improvement are provided.

Minimally, two moot/mock courts are required. The first, early in training, is a serology mock court on an actual small case; this covers the initial forensic biology training topics. The second, after the analyst has completed training, is a DNA mock court on an actual DNA case; this covers all forensic biology training topics. If necessary, additional mock courts can be scheduled.

F. Supplemental Training

Scientists will be introduced to new procedures as they are added. Usually, this will include a lecture covering the theoretical and practical aspects of the procedure; a reading list selected from the scientific literature will be provided. The three-phase training method (trainee observes the analytical procedure, trainee demonstrates the analytical procedure, and independent practice) will also be used for most supplemental training.

Once the analysts are comfortable with the new procedure, they will be given competency test samples, which must be successfully completed for each new procedure before the analyst can use the procedure in casework.

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3. SPECIFIC GUIDELINES		
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A. Training modules

The training is divided into modules. The number of modules taken depends on the job title of the trainee; fewer or additional modules may be given depending on the particular job assignment of the trainee.

	Lab Associate	Criminalist I	Criminalist II
Right to know (hygiene officer)	X	X	X
Digital photography			X
Evidence exam			X
Serology - blood presumptive		X	X
Serology - species determination			Selected staff
Serology - AP and sperm		X	X
Serology - amylase		X	X
Small cases			X
35 mm photography			X
Serology mock court			X
Sexual assault kits		X	X
Exemplar processing		X	X
P30 ELISA	X	X	X
Hemoglobin	Selected staff	Selected staff	Selected staff
Chelex Extraction	X	X	X
QuantiBlot	X	X	X
PCR amp		X	X
PCR amp & CE (ABI 310)			X
PCR amp & CE (ABI 3100)			X
Dilutions & mixtures			X

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	Lab Associate	Criminalist I	Criminalist II
STR interpretation			X
DNA written exam	Limited	Limited	X
DNA oral exam			X
DNA mock court			X
Blood spatter	Selected staff	Selected staff	X
FT-IR review	X	X	X
FT-IR practical	X	X	Selected staff

B. Required lectures

Most of the training modules have required lectures. Lectures are given by staff members, generally prior to beginning each training module. Many of the lectures are also available as computer presentations found in the departmental directories, and can be reviewed as necessary.

C. Required reading

All of the training modules have required reading. Much of the information is found in the reference binder supplied to trainees. However, the analysts are also required to read the appropriate sections of manuals, chapters in books, etc. The required reading should be completed during the time allotted to the training module.

D. Practice samples

For serology training (blood presumptive tests, species identification, semen presumptive tests, semen confirmatory tests, and amylase) practice samples can come from a variety of sources: the trainee, stains from previous external proficiency tests, or casework extracts previously tested for P30 and/or amylase.

The number of serology training samples is variable, depending on the training module. The number of tests performed is much greater, as specified in the practical exercises of each module.

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For DNA training practice samples of known DNA types are required. Because these are practice samples, the DNA types may be supplied to the trainee along with the samples. These can be stains representing laboratory personnel, exemplar stains from casework, or stains from previous external proficiency tests. *A sample from the trainee is mandatory, for addition to the LABTYPES database holding the DNA profiles of staff members.*

The number of DNA samples must include at least one of each of the following: blood stains, mixed semen stains, saliva stains, and hair samples. They should be supplied in sufficient quantity for the trainee to be able to do more than one analysis if necessary. The number of tests performed is much greater, as specified in the practical exercises of each module.

The trainee will generally use these same practice samples for all DNA procedures - Chelex extraction, QuantiBlot, amplification and DNA typing.

During observation, the observer/trainer should evaluate the ability of the trainee for independent performance of the procedure. If the observer/trainer determines the trainee is not performing independently, additional observation and training is required. Once the observer/trainer determines the trainee is capable of performing independently, the observation period of training is complete, and can be signed off. Independent practice is at the discretion of the trainee.

E. Competency samples

For the DNA modules, it is preferable that these be from previous external proficiency tests. They must be coded to render them anonymous to the trainee.

Module	Sample type	Minimum number of Competency samples
Serology - blood presumptive	Blood/no blood	4
Serology - species identification	Human/not human	4
Serology - sperm identification	Sperm/no sperm	4
Serology - amylase identification	Amylase/no amylase	4
P30 ELISA	Semen/no semen	4
Chelex extraction	Blood and/or saliva stains	3
	Mixed semen stains	2

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Module	Sample type	Minimum number of Competency samples
QuantiBlot	Previously quantitated samples - the Chelex samples from above or others supplied by trainer	10 (5 sets of neat and 1/10 dilutions)
PCR amp/CE (ABI 310 and 3100)*	Blood and/or saliva stains, mixed semen stains - the Chelex extracts from above	5*
Hemoglobin	Adult, fetal, and/or other variant blood stains	5
FT-IR Review	FT-IR spectra of samples containing detectable levels of PDMS or not containing detectable levels of PDMS	10
FT-IR Practical	Samples containing detectable levels of PDMS or not containing detectable levels of PDMS	3

The trainee will use these same competency test samples for all DNA procedures - Chelex extraction, QuantiBlot, amplification and DNA typing. Since these are competency test samples, the DNA types are not to be supplied to the trainee.

Trainees who start training after extraction steps (e.g., they have previously passed extraction competency) will be given five DNA extracts or five unknown samples of PCR amp product as their competency test. The DNA extracts/PCR amp product can be of any type (blood/saliva/mixed semen stains).

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F. Review procedures

The results from the trainee's practice samples and competency tests will be evaluated by his/her direct supervisor in terms of sensitivity, consistency, and contamination at each of the steps in the training. In addition, the supervisor must ensure that the trainee is analyzing the proper control samples, is correctly and completely filling out worksheets and logbooks used to document sample analyses, and is familiar with the operation of the equipment necessary to perform the tests. It may be helpful to include the trainer in this review process.

Problems will be addressed at each rotation and additional practice instituted, if necessary. For example, the supervisor must check the trainee's work for contamination. Low-level contamination (the presence of alleles that do not meet laboratory reporting criteria, such as small peaks in STR analysis) may not affect the typing results. Such contamination may often be eliminated by simply changing a reagent. However, if the analyst consistently demonstrates low-level contamination, he/she must be observed more closely during subsequent practice runs to identify the reason for the problem.

The direct supervisor must sign off on each module, indicating completion of all practical exercises and successful completion of the competency test, if applicable.

G. Completion of training

At the completion of each analytical training module, a written notification must be made to the trainee by the direct supervisor that he/she has successfully passed the competency test and that the analyst may now perform that technique on casework samples. The notification will generally take the form of initialing the Forensic Biology Training Checklist. After successful completion of the formal training period, for Lab Associate and Criminalist I, written notification of completion will be provided in the form of a letter. This notification is filed in the training folder.

Once an analyst has completed all the requirements to become a DNA interpreting analyst, the Technical Leader must issue a written notification which acknowledges the successful completion of the requirements: completed all training modules (except DNA mock court), all three classes, population statistics, six months DNA lab experience, and successful completion of a DNA competency test. This notification is filed in the training folder. As of that date, the analyst may interpret DNA results and sign DNA reports.

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H. Criminalist III Training

As a supervisor, a Criminalist III has additional duties in addition to routine casework. To prepare for those duties, additional training consists of supervisory reviews.

I. Criminalist IV Training

As a supervisor, a Criminalist IV has duties in addition to routine case work. To prepare for those duties, additional training consists of supervisory demonstration and reviews.

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