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Revision History:

August 20, 2010 – Initial version of manual.

March 28, 2011 - Revised Section 2 (Training Program Guidelines) to include ethics, general forensic science, quality assurance/quality control, and the basics of the legal system in the theoretical background training, and specified requirement for all Forensic Biology employees to attend an annual review of the ASCLD/LAB *Guiding Principles of Professional Responsibility for Crime Laboratories and Forensic Scientists;* Revised Section 3 and 4 by referencing a new "Required Training Lectures" list in the manual. This list is accessible through Section 4 (Modules).

July 16, 2012 – Entire manual revised for LIMS implementation. Names of approvers removed and replaced with general terminology. New training modules added: 12D, 22A, and 22B.

April 1, 2014 – Section 3.E was updated to state that competency in either organic or bone extractions satisfies the competency requirements for the mitochondrial hair extraction procedure.

1. PROGRAM OVERVIEW

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The purpose of the training program is to provide analysts with the theoretical and practical means necessary to perform reliable testing. For staff members who are DNA Interpreting Analysts, this includes training to learn how to present 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/promoted staff is 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; the modules correspond to duties in the laboratory: evidence examination, sexual assault kit processing, exemplar processing, extraction, quantitation, 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 a reporting analyst.

Current staff is trained in new procedures as they are added. For each new technique implemented an analyst must successfully complete the new training module before using the procedure in casework. If a current analyst's job duties change or retraining is necessary, supplemental training is done using the current training module for that technique. Successful completion of the module is required before the analyst will be allowed to perform the technique in casework. Successful completion of each module is documented on the competency tracking sheet or via a certificate of completion issued by the Training Group.

During training periods, staff should spend as much time as possible in training in order to expedite the process and help it to proceed more smoothly. This means that flexible or compressed time schedules, attendance at professional meetings and participation in special projects 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 evidence examination, identification of physiological fluids, molecular biology, separation technology, interpretation of complex DNA results, statistical concepts as they relate to forensic DNA analysis, and court testimony.

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 Directors, Assistant Directors, and/or Criminalist IV supervisor. The training may be provided by any Criminalist I or higher who is competent and has the appropriate level of experience (generally, at least three months of casework experience performing the specific procedure).

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 Directors, Assistant Directors, and/or Criminalist IV supervisor. The training may be provided by any Criminalist II or higher who is competent and has the appropriate level of experience (generally, at least three months of casework experience performing the specific procedure).

The trainee may not interpret DNA results (STR CE processing and signing DNA reports) until they become a DNA Interpreting Analyst. This means that they(1) meet or exceed the degree and educational requirements as defined by the applicable "FBI Quality Assurance Standards for Forensic DNA Testing Laboratories (2) have a minimum of six months of documented forensic human-DNA lab experience, (3) successfully completed all training modules, (4) successfully completed a written exam, oral exam, and DNA moot court. 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 by an analyst prior to interpreting and reporting DNA results.

Failure to satisfactorily complete competency tests, written or oral examinations, DNA mock court, 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 record

The training is documented and maintained in a training record. The training record may contain notes, results, photographs, etc. generated during training. In addition, for each topic the date and initials of the trainer should be documented. The direct supervisor should regularly review the contents of the training record for accuracy and completeness.

The training record is the property of the Department of Forensic Biology and will be retained by the Department.

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.

For Criminalist I's the training is limited. Once competency is attained in a module, the trainee may be given a one or two week assignment in that technical rotation performing analysis on casework samples.

For Criminalist II's and above, the training is continuous and does not include intermediate assignments to technical rotations. Once all required training modules and DNA moot court is complete, the trainee joins the pod/functional group system.

E. Roles and responsibilities

Training Team	The training team is responsible for periodic review and/or revision of the Training Manual and reference articles. The training team is responsible for preparation of training schedules, training assignments, and training records. This includes scheduling of training given by OCME staff other than those from the Department of Forensic Biology. The training team is responsible for ensuring that practice samples and competency test samples are prepared. The training team is responsible for ensuring that reference material is available. The training team is responsible for maintaining the training records of current analysts.
Trainee	The trainee is expected to be ready by no later than 9 am each day there is directly supervised training (observation or demonstration of a technique). A more flexible schedule may be possible on days where the trainee is working on practical exercises, practice samples, or competency tests. 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. The trainee is responsible for getting all the necessary training signatures and for compiling all required training documentation. At the completion of training the trainee is responsible for providing the complete training record to the Training Team for review.

Trainer

The trainer is expected to be ready to go no later than 9 am each day in which 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, the scheduled trainer 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 days allocated for the module.

The trainer must review any paperwork/documentation/records 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 monitoring the trainee's progress. The supervisor must plan on regularly spending time with the trainee, for example, by scheduling weekly or biweekly meetings in order to:

- Discuss the topics covered by the required reading and document completion of the reading.
- Review the answers to the written questions.
- Review the training record for completeness and accuracy.
- Review, determine and document the successful completion of competency tests.

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

The (future) direct supervisor is responsible for acting as defense attorney for DNA mock court.

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 record, including review of competency tests as needed. The Technical Leader may designate a training supervisor and/or Assistant Director to assist in this review.
- Final review of the answers to the written questions. The Technical Leader may designate a training supervisor and/or Assistant Director to assist in this review.
- Evaluation of the oral examination, including any needed remediation. The Technical Leader may designate a DNA supervisor and/or Assistant Director to assist in the evaluation and remediation of the oral exam.
- 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 notification of completion of training and the notification of achievement of DNA Interpreting Analyst status.

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. The training program also includes instruction in general topic areas such as ethics, general forensic science, quality assurance/quality control, and basics of the legal system. 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 maintained by the department including methods manuals used in the laboratory which contain reference bibliographies for the scientific procedures. Publications pertaining to in-house methods are given to each trainee in the form of an online Reference Articles. Additionally, OCME professional staff has library and Internet privileges at the neighboring New York University Medical School library.

B. Practical experience

Each analyst will be trained to perform the analytical procedures that are appropriate to the job title and specific work assignment. Practical training may include up to three phases: the trainee observes the procedure being performed; the trainee uses practice specimens to demonstrate the procedure to the trainer; and the trainee uses practice specimens to perform the procedure independently. It may be necessary for a trainee to demonstrate a procedure multiple times until a trainer determines that the trainee can perform the procedure independently. Practical training for procedures currently in use that have been updated or revised may or may not require all three training phases.

Analysts with previous experience, either from another accredited laboratory or previous OCME training, at the discretion of the Training Supervisor, Assistant Director, Technical Leader, and/or Director may have their practical training modified. This modification will be documented in the training folder.

C. Competency testing

At the conclusion of the practical training in any particular analytical procedure, the trainee is expected 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 Director, Technical Leader, and/or Director. Successful completion of each module is documented on the competency tracking sheet or via a certificate of completion issued by the Training Group.

D. Written assignments and oral examination

New scientific staff must take and pass the written assignment for each module they are trained in. The written assignment is reviewed and graded by the Technical Leader, training supervisor or designee.

New scientific staff, Criminalist II's and above must take and pass an oral examination covering several areas of DNA theory and analysis. The oral examination is attended by the trainee's direct supervisor and the test administrator. Each Criminalist has a maximum of two attempts to pass the full examination. The determination of whether or not a Criminalist passes the examination is at the discretion of the examination committee. At the examination committee's discretion, the Criminalist shall have up to two attempts to remediate each full examination. The committee is not obligated to grant any remediation.

If a Criminalist has not passed the full oral examination after two attempts, the Criminalist may be subject to demotion or termination.

In addition to the basic DNA oral examination, mtDNA interpreting analysts are required to take and pass a mtDNA oral exam covering mtDNA theory and methods.

E. Court preparation

An important part of training is learning to present scientific information in court. There are several ways for trainees to prepare for court and public speaking: observing the testimony of laboratory personnel at court, attending pre-trial conferences, and testimony training. Before testifying in court or grand jury, Criminalist II's and above must successfully complete an internal courtroom testimony training module. The purpose of the courtroom testimony training module is to give the analyst an introduction to the courtroom process as well as practical testimony experience prior to actual testimony in a trial or grand jury. It is also a mechanism for the supervisory staff to identify and correct any problems the analyst may have in his/her knowledge or ability to communicate effectively.

Moot/Mock court training consists of practice testimony covering all areas of testimony including qualifications, voir dire, and direct and cross examination using case examples. The Criminalist practices giving testimony in those areas prior to being tested in a mock court with the training group. Minimally, two moot/mock courts are required. The first, early in training, is a serology mock court; this covers the initial forensic biology training topics. Serology moot/mock court is conducted by the training group. The second, no more than two weeks after an analyst has completed training, is a DNA moot/mock court. The DNA moot/mock court covers all forensic biology training topics.

The Criminalist's testimony is evaluated by a jury comprised of qualified scientific staff (DNA interpreting analysts with at least one trial testimony or training staff). Checklists are used to structure the evaluation of the trainee's performance in each mock court. After the moot/mock court, constructive criticism of the trainee's testimony is given, and, if needed, specific suggestions for improvement are provided. A pass/fail determination for the serology moot/mock court is made by the training group. For the DNA moot/mock court an average grade of 70% or greater must be achieved by the Criminalist in order to pass. Grades should be provided in writing to the analyst within at least two business days after the moot/mock court. An analyst, who does not achieve an initial passing grade, must complete and pass a second moot/mock court within one month.

If a Criminalist has not passed the DNA moot/mock court after two attempts, the Criminalist may be subject to demotion or termination. Successful completion of the moot/mock courts must be documented in the training record.

Analysts who train in specialized DNA techniques such as mitochondrial DNA testing and high-sensitivity DNA testing may be required to pass an additional moot/mock court covering the specific topic area.

F. Continuing and Supplemental Training

Analysts are trained in new procedures as they are added and as their job duties change. Supplemental training may include a lecture covering the theoretical and practical aspects of the new procedure; a reading list selected from the scientific literature and full (three-step) or modified (two-step) practical training. The modified (two-step method) does not require the independent practice of the analytical procedure. The modified (two-step method) training is used when procedures have been updated or revised.

Once the analyst has successfully completed the observed practice, they are given a competency test. An analyst must pass the competency test prior to performing the procedure on casework. Successful completion of each module is documented on the competency tracking sheet or via a certificate of completion issued by the Training Group.

The specific requirements of continuing and supplemental training for each procedure are determined by the appropriate Technical Leader or training supervisor. When a new procedure or technique is established in the Laboratory, a training module is added or updated in the Training Manual appendix.

G. Retraining

Retraining can be the result of requests from supervisors or analysts or in response to a proficiency test or casework corrective action.

The retraining program initiated at the request of an analyst or supervisor will be determined by the Training coordinator and can involve additional observations, practices or competency tests depending on the needs of the analyst.

If it is determined by the Quality Assurance Manager and/or a Technical Leader that a deficiency in proficiency testing or casework is the result of analyst's lack of understanding of the methods, procedures, and/or protocols used by the laboratory, the analyst will be prohibited from performing the test in casework until he/she has been re-trained, and a new competency test has been successfully completed. In these cases, all re-training must be performed in accordance with the general and specific training guidelines specified in the Forensic Biology Training Manual.

H. Continuing Education

Continuing education is an educational activity that is offered by a recognized individual or organization that brings participants up-to-date in their relevant area of knowledge. Analysts are provided the opportunity to obtain continuing education through attendance at scientific meetings and seminars both onsite at the Department of Forensic Biology and offsite.

Each analyst's earned Continuing Education hours are documented and maintained by the Training Group.

Every Forensic Biology employee is required to attend an annual review of the *ASCLD/LAB Guiding Principles of Professional Responsibility for Crime Laboratories and Forensic Scientists.*

Documentation of content and attendance at appropriate continuing education activities is provided by sign-in sheets, certificates of attendance, program agenda/lecture title, travel authorization, resume/publication/other documentation of the credentials of the presenter(s), and other means, depending on the type of event.

Records are maintained by the Training Group for at least one ASCLD/LAB cycle of accreditation or 4 years, whichever is greater.

I. Review of Current Literature

The Forensic Biology Assistant Director assigned to Training or designee distributes relevant, scientific articles of interest to staff via e-mail on a regular basis, usually monthly. These articles are stored by the Training Group on the Forensic Biology server. Analysts are also encouraged to read other scientific articles of interest.

Analysts document their reading of the distributed articles and/or other scientific literature via a record distributed quarterly by the Training Group.

Records are maintained by the Training Group for at least one ASCLD/LAB cycle of accreditation or 5 years, whichever is greater.

A. Training Specific Guidelines

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

	Criminalist I	Criminalist II and above
Right to know (hygiene officer)	X	X
Serology - Blood Presumptive	X	X
Serology – Acid Phosphatase	X	X
Serology – Sperm	X	X
Serology -Seratec PSA	X	X
Serology -Seratec Amylase	X	X
Evidence Exam	X	X
Sexual Assault Kits	X	X
M48 Extraction	X	X
Auto Differential Extraction	X	X
Chelex Extraction	X	X
Microcon	X	X
Quantitation-qPCR	X	X
PCR Amplification	X	X
CE (ABI 3130 set up)	X	X
STR Analysis	No	X
Dilutions & Mixtures	No	X
Report Writing	X	X
Written exam	Selected Modules	X

	Criminalist I	Criminalist II and above
DNA Oral Exam	No	X
Serology and DNA mock court	No	X
Technical Review	No	X

Additional Training

Additional training, such as bone processing and mitochondrial DNA testing, may be offered to analysts who require such training. In this case, training will be provided by a competent analyst and follow the standard model of observation, practice, and competency. In these cases, training samples may be provided.

	Criminalist I	Criminalist II and above
Organic Extraction	Selected Staff	Selected Staff
Bone Processing	Selected Staff	Selected Staff
POC Processing	Selected Staff	Selected Staff
Post Mortem Blood Processing	Selected Staff	Selected Staff
mtDNA hair extraction	X	X
mtDNA duplex amplification	X	X
Agilent quantitation	X	X
mtDNA cycle sequencing	X	X
ABI 3130 set-up	X	X
mtDNA data processing & interpretation	No	X
mtDNA mock court	No	X
mtDNA oral examination	No	X

	Criminalist I	Criminalist II and above
High Volume Exam	X	n/a
Sample Control	X	X
HPLC	X	X
Post Amplification PE-Testing	X	X
Post Amplification SC-Testing	X	X
PE Data Analysis	No	X
SC Data Analysis	No	X

B. Required lectures

Most of the training modules have required lectures (see Section 4 – Modules). Each individual training module specifies the required lecture(s) associated with the module. Some required lectures, e.g., Ethics, and the review of the ASCLD/LAB Guiding Principles, are not associated with specific training modules. See the list of **Required Training Lectures** in the Training Modules section of this manual.

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 needed. The trainee's attendance at the required lectures is documented in the Lecture Tracking Sheet and signed off by the lecturer.

C. Required reading

All of the training modules have required reading. Most of the required readings are found in the online reference folder. 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. Completion of all the required reading is documented by the analyst and direct supervisor.

D. Practice samples

For serology training (blood presumptive tests, 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 case work extracts previously tested for PSA and/or amylase.

The number of serology training samples is variable, depending on the training module.

Practice DNA training samples consist of coded swabs or specimens donated by laboratory personnel or from previous external proficiency samples. The DNA donor types and associated codes are maintained by the Training Team and are kept confidential. When a trainee generates a DNA result for a sample the trainee or supervisor provides the DNA type and code to the Training Team to check for correctness.

The number of DNA samples may include any of the following: blood stains, semen mixed and non mixed stains, saliva stains, and other samples. The number of DNA samples should be supplied in sufficient quantity for the trainee to be able to do more than one analysis if necessary.

Practice DNA training samples will generally be provided by the Training Team; however, for specialized training (e.g., bone or hair extraction and typing), samples may be provided by specific specialty team. The trainee will generally use these same practice samples for all DNA procedures - extraction, quantitation, amplification and DNA typing. However, if needed, training samples can be provided as DNA extracts or amplified DNA.

During observation, the trainer should evaluate the ability of the trainee for performance of the procedure. If the trainer determines the trainee is not performing a technique correctly, additional observation and training is required. Once the trainer determines the trainee is capable of performing the technique correctly, the observation period of training is complete. An independent practice is then performed and evaluated by the trainee's supervisor. If the supervisor determines the trainee is not independently performing the procedure correctly an additional practice and or training is required. Once the supervisor determines the trainee is able to independently perform the procedure correctly, the practice period of the training is complete.

E. Competency samples

For the DNA modules, trainees are provided with competency DNA samples that are coded in the same manner as the practice samples. When a trainee generates a DNA result for a sample, the trainees' supervisor provides the DNA type and code to the Training Team to check for correctness.

The minimum number of competency samples is variable, depending on the training module. The minimum number for each module is listed below.

Module	Sample type	Minimum number of Competency samples
Serology - blood presumptive	Blood/no blood	4
Serology – semen presumptive	Semen/no semen	4
Serology- sperm identification	Sperm/no sperm	8
Serology – Seratec Amylase	Amylase/no amylase	4
Serology – Seratec PSA	Semen/no semen	4
Chelex extraction	Semen Mixed/Non Mixed Stains	2
Auto Differential Extraction	Semen Mixed/Non Mixed Stains	3
M48 extraction	Buccal Samples	22
Microcon	Semen Mixed/Non Mixed Stains	4

Module	Sample type	Minimum number of Competency samples
Quantitation	The extracted samples from above or others supplied by trainer	26
PCR amp/CE (ABI 3130)	The extracted samples from above or others supplied by trainer	26
mtDNA organic hair extraction	Hair shaft (no root)	3*
Duplex Amplification/Linear Array	Extracts from the above mtDNA extractions, or other extracts	3 + controls
Cycle Sequencing/3130/Data Analysis	Amplified products from the above or other amplified products	3 + controls

*If the trainee is competent in either the organic extraction or bone extraction procedures, this will also satisfy the competency requirements for the mitochondrial DNA hair extraction procedure.

The trainee may use these same competency test samples for all DNA procedures - extraction, quantitation, amplification and DNA typing.

Trainees who start training after extraction steps (e.g., they have previously passed extraction competency) will be given at least three coded DNA extracts or three coded samples of PCR amp product as their competency test. The DNA extracts/PCR amp product can be of any type (buccal samples or semen stains).

Once the supervisor determines the trainee has performed and generated the correct results for the competency, the supervisor documents the successful completion of each module on the competency tracking sheet.

F. Review procedures

The results from the trainee's practice samples and competency tests will be evaluated by his/her direct supervisor or designee in terms of sensitivity, consistency, and for possible contamination at each of the steps in the training. In addition, the supervisor or designee must ensure that the trainee is analyzing/using the proper control samples, correctly and completely filling out all documentation used to record sample analyses, and is familiar with the operation of the equipment necessary to perform the tests. The trainer should be included in this review process.

Problems will be addressed at/during each module and additional practice instituted, if necessary. For example, if possible contamination is observed and/or detected during any of the procedures the supervisor must determine if the contamination is due to a reagent/instrument or the trainee. If determined to be the result of a contaminated reagent, the reagent may be changed and additional practices may not be necessary. However, if the contamination is the results of the analysts' performance, then an additional practice must be performed to identify the reason for the problem.

The direct supervisor or designee must document completion of all practical exercises and successful completion of the competency tests, if applicable, for all modules.

G. Completion of training

At the completion of each analytical training module, a notification must be made to the trainee and training team that the trainee has successfully passed the competency test. Once deemed competent, the analyst may perform that technique on casework samples. The completion of each competency is documented on the competency tracking sheet or via a certificate of completion issued by the Training Group.

Once an analyst has completed all the requirements to become a DNA Interpreting Analyst, had their training folder reviewed by the Training Coordinator and had all the education and experience requirements as specified by the FBI DNA Quality Assurance Standards reviewed, the Technical Leader issues a written notification which acknowledges the successful completion of training. This notification is filed in the training folder. As of that date, the analyst may interpret DNA results and sign DNA reports.

H. Criminalist Review Training

Fully trained interpreting analysts that have been in their current title for at least three months have duties in addition to routine benchwork. To prepare for those duties, additional training consisting of result and case file reviews are done.

An experienced Criminalist demonstrates how to perform a review of the analytical test results on various procedures and technical reviews of case files. Each analyst must demonstrate their ability to perform reviews on these test results and case files. This is accomplished by having the analysts' supervisor or designee perform a second review and sign the test results or case files. Successful completion of review training is documented on the competency tracking sheet or via a certificate of completion issued by the Training Group.

The number of second reviews necessary is dependent on the type of review. If the supervisor determines the analyst is not performing the reviews correctly, additional second reviews may be required. Once the minimum number of second reviews has been successfully met for a particular technique the analyst may perform reviews on their own.

	Minimum Number of Second Reviews	Review Training
STR/mtDNA Analysis	5	Criminalist II and above
Negative DNA Case File Review	5	Criminalist II and above
Positive DNA Case File Review	10	Criminalist III and above

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 evidence case sign in and scheduling case analysis.

An experienced Criminalist IV, Assistant Director or designee demonstrates how to sign in evidence which includes review of all NYPD paperwork, creating and reviewing of Forensic Biology Database records and scheduling analysis of evidence for different case types. A new Criminalist IV must then demonstrate their ability to perform these techniques. This is accomplished by having an experienced Criminalist IV, Assistant Director or designee perform a second review of all paperwork and scheduled analysis prior to the case acceptance into the laboratory. Successful completion of signed in cases is documented on the competency tracking sheet or via a certificate of completion issued by the Training Group.

If the supervisor determines the new Criminalist IV is not performing sign in correctly additional second reviews may be required. Once the minimum number of signed in cases has been successfully met the new Criminalist IV may now perform sign in on their own.

	Minimum Number of Second Reviews
Evidence Sign In	10

A Criminalist IV is required to have successfully completed all other Criminalist review training.

J. Assistant Director Training

As manager, an Assistant Director has duties in addition to casework supervision. To prepare for these duties, additional training consists of enhanced technical review.

A new Assistant Director must demonstrate their ability to perform enhanced technical review of cases containing complex deconvolution of DNA mixtures, kinship or paternity cases, and cases with comparisons of known profiles to mixtures of DNA. This is accomplished by having an experienced Assistant Director, Deputy Director, or Director perform a second review of the case file and co-sign the technical review. Successful completion of an enhanced technical review is documented on the competency tracking sheet or via a certificate of completion issued by the Training Group.

Once the minimum numbers of enhanced technical reviews have been successfully met, the new Assistant Director may perform enhanced technical reviews on their own.

	Minimum Number of Second Reviews
Enhanced Technical Review	10

An Assistant Director is required to have successfully completed all other Criminalist review training.

MODULES		
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Modules:

M14A STR Review

M14B Technical Review

Specialty Training Modules:

M15 Mitochondrial DNA Hair Extraction

M16 Mitochondrial DNA Roche and homebrew Duplex Amplification

M17 Mitochondrial DNA Agilent Analysis

M18 Mitochondrial DNA Sequencing

M19 Mitochondrial DNA Data Interpretation

M20 Mitochondrial DNA Mock Court

M21 Organic Extraction

M22 LCN Extraction

M23 Identifiler 31 STR Analysis

M24 Minifiler Analysis

REQUIRED TRAINNG LECTURES		
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REQUIRED LECTURES
Right-to-Know
General Forensic Science
Ethics
Serology
Sexual Assault Kits
Basics of the Legal System*
DNA Extraction
QA/QC and Accreditation
DNA Quantitation
PCR Theory*
3130 Capillary Electrophoresis*
Basics of STR Typing*
CODIS*
Mitochondrial DNA Typing*
STR Mixture Interpretation*
Basics of Population Genetics*
Basics of the Legal System*
ASCLD/LAB Guiding Principles

* Interpreting Analysts only

CRIMINALIST IV TRAINING MODULE		
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Module: Criminalist IV training

Required lectures: None

Required reading:

Tasks and standards for Criminalist IV

Tasks and standards for Criminalist III

Tasks and standards for Criminalist II

Tasks and standards for Criminalist I

Time and Leave manual (online)

"Supervisor's Guide to Reviewing Time Cards" (online)

Review the Management Systems Manual

Review the Administrative Manual

Review the Training Manual
-Training folder requirements,
-Training roles and responsibilities

Review the Criminalist III's, II's and I's duties

Review the Serology Manual
-Requirements for interpretation of P30 and amylase

Review the Protocols for Forensic STR Analysis Manual
-Requirements for interpretation of STR results
-STR trouble-shooting
-Requirements for interpretation of RtPCR results
-RtPCR trouble-shooting

Review the Evidence and Case Management Manual
-Evidence examination guidelines
-Report guidelines
-Data analysis, documenting, archiving, reporting, case record review
-Evidence Sign in Procedures

Practical Exercises

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

An Assistant Director or designee must conduct a second technical review of the following items after the Criminalist IV has done so:

- First 10 cases signed in as evidence

**For specialty groups training interpretations can be found on the network: (M:FBIOLOGY_MAIN\TRAINING\TRAINING INTERPRETATION AND REVIEW\CRIMINALIST)*

Competency Test:

None

KSA's to be Mastered:

1. Be able to supervise Criminalist I's, II's and III's including review of case records, reports, training and time and leave issues.
2. Be able to perform technical review on all types of cases.
3. Be able to supervise evidence exam and evidence sign in.

Other formal supervisory training (courses, lectures, workshops, etc.) will be offered as available.

Final Actions:

1. Discuss module with your direct supervisor.
2. Supervisor or designee documents completion on all required second reviews.

CRIMINALIST REVIEW TRAINING MODULE		
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Module: Criminalist Review training

Required lectures:

None

Required reading:

Review the Management Systems Manual

Review the Administrative Manual

Review the Serology Manual
-Requirements for interpretation of PSA and Amylase

Review the Protocols for Forensic STR Analysis Manual.
-Requirements for interpretation of STR results
-STR trouble-shooting
-Requirements for interpretation of RtPCR results
-RtPCR trouble-shooting

Review the Evidence and Case Management Manual
- Evidence examination guidelines
- Report guidelines
- Data analysis, documenting, archiving, reporting, case record review

Practical Exercises

Fully trained Criminalist's have additional duties in addition to routine benchwork. To prepare for those duties, additional training consists of reviews.

The Criminalist IV or designee must conduct a second review of the following items after the Criminalist has done so:

- First 5 negative case technical reviews.
- First 5 reviews for STR's
- First 10 positive case reviews (Crim III's and above)
- First 5 administrative reviews

**For specialty groups training interpretations could be found on the network: (M:FBIOLOGY_MAIN\TRAINING\TRAINING INTERPRETATION AND REVIEW)*

Competency Test:
None

KSA's to be mastered:

1. Be able to perform technical review on negative cases.
2. Be able to perform technical review on STR results.
3. Be able to perform technical review on positive cases.
4. Be able to perform adminstrative reviews on all cases types.

Other formal training (courses, lectures, workshops, etc.) will be offered as available.

Final Actions:

1. Discuss the module with your direct supervisor.
2. Supervisor or designee documents completion on all required second reviews.

FORENSIC BIOLOGY TRAINING MANUAL

MODULE 1: BASIC LABORATORY TECHNIQUES		
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Laboratory Safety, Clean Techniques & Basic Lab Equipment

Required lecture

Right to Know
Guidelines given on first day

Required Reading

1. Study the articles in the online reference folder on this topic.
2. Study the Evidence and Case Management Manual.

Practical exercises

1. Familiarize oneself with placement of safety equipment, such as eye washes, fire extinguishers, and safety showers.
2. Familiarize oneself with the location of all the personal protective equipment such as lab coats, gloves and eyewear used.
3. Familiarize oneself with the placement of all basic laboratory equipment used in the laboratory.
4. Perform correct pipetting technique using different µL volume pipettes.
5. Perform proper set up and clean up techniques for bench tops, tools and pipettes used in the laboratory.
6. Answer written questions pertaining to the module.

Competency test

None

KSA's to be mastered

1. Be able to locate and use safety and person protective equipment in the laboratory.
2. Know the placement of the basic laboratory equipment used.
3. Be able to properly clean tools and bench tops and explain the necessity for these techniques.
4. Be able to properly use different µL volume pipettes

Final Actions

1. Discuss the module with a supervisor or designee, including review and results of questions for the module.
2. Have a supervisor or designee document successful completion of the module. *The initials/signature of a supervisor or designee indicates that all practical exercises have been completed and the correct results have been obtained on the competency test (if applicable).*

MODULE 10: PCR DILUTION AND MIXTURE EXERCISES		
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Required lecture
OCME PCR validation studies
Basics of STR mixture interpretation

Required reading
1. Study the articles in the online reference folder on this topic.
2. Study the interpretation of complex STR results in the Protocols for Forensic STR Analysis.

Practical exercises

At this point, the trainee will be working independently, performing dilution and mixture studies, which will aid in interpretation of complex PCR typing results.

1. Using the quant values for the samples listed below calculate the amount of sample (and TE if needed) to create mixtures for ratios of 10:1, 8:1, 4:1, 2:1, 1:1, 1:2, 1:4, 1:8, 1:10 for the current PCR STR system.

    a. Sample 1 -- 3122.8 pg/ul

    b. Sample 2 -- 1563.6 pg/ul

2. Using the quant values for the sample listed below calculate the amount of sample (and TE if needed) to create mixtures for the ratios of 10:1, 8:1, 4:1, 2:1, 1:1, 1:2, 1:4, 1:8, 1:10 for the current PCR Autosomal system.

    c. Sample 1 -- 1563.6 pg/ul

    d. Sample 2 -- 2754.1pg/ul

2. Using the quant value for the sample below calculate the amount of sample (and TE if needed) to create the following pg/ul values : 2000, 1000, 500, 250, 100, 50, 25 and 10 pg for the current PCR STR and Autosomal systems

    a. Sample 1-- 2763.6 pg/ul

4. Using the mixtures found in M:\FBIOLOGY_MAIN\TRAINING\Interpretations Reviews and Exercises\Mixture Interpretation perform the following for each:

    1. Determine the # of contributors to the mixture.
    2. Determine if the mixture can be deconvoluted.
    3. Determine the mixture ratio.
    4. Determine the DNA profile of the major contributor.
    5. Determine the DNA profile of the minor contributor.

Competency test: None

KSA's to be mastered

1. Be able to identify mixtures and determine the relative proportion of the components.
2. Understand the limitations of each system to resolve mixtures of different proportions.
3. Understand the sensitivity of each system.

Final actions

1. Discuss the module with a supervisor or designee, including review of results and discussion of theory and practical aspects of module.
2. Have a supervisor or designee evaluate the conclusions developed in the written interpretation.
3. Have a supervisor or designee document successful completion of the module. *The initials/signature of a supervisor or designee indicates that all practical exercises have been completed and the correct results have been obtained on the competency test (if applicable).*

MODULE 11: PCR DATA INTERPRETATION EXERCISE		
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Required lecture

OCME PCR validation studies
Basics of STR mixture interpretation
Basics of population genetics and statistics

Required reading

Study the articles in the online reference folder on this topic.

Practical exercises

The trainer will provide the trainee with a series of data representing the range of results that are typically observed in PCR DNA typing cases. The trainee must independently evaluate the data and be able to discuss his/her interpretation of the data. These interpretations will be discussed in a meeting with Criminalist IV's and/or an Assistant Director.

Competency test

None

KSA's to be mastered

1. Be able to create DNA reports, including appropriate statistics, using the standard report format and template statements of the Department of Forensic Biology.
2. Be able to evaluate initial DNA results and draw correct conclusions.
3. Be able to evaluate initial DNA results and determine what further testing might be needed.
4. Be able to determine the proper statistical information for each DNA scenario.

Final actions

1. After the meeting discuss the module with a supervisor or designee, including review of results and discussion of theory and practical aspects of module. Review the reports that were created and the changes and suggestions made during the meeting.
2. Have a supervisor or designee off on successful completion of the module.

MODULE 13: ORAL EXAMINATION		
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Required lecture

All the technical lectures plus the CODIS, QA/QC, Ethics and Accreditation lectures.

Required reading

All.

Practical exercise

None.

Competency test

Criminalist, Levels II, III, and IV, whose job functions require "Nuclear DNA Interpreting Analyst" status are administered an oral examination as a final qualifying test. The oral examination contains a set of questions designed to assess the competence of the Criminalist to become a DNA Interpreting Analyst. Additional follow-up questions may be asked during the examination if problem areas are discovered. Every question must be answered correctly, either during the actual oral examination or its associated remediation(s), for a Criminalist to pass.

The determination of whether or not a Criminalist passes the examination is at the sole discretion of the examination committee. If the committee is not unanimous in the decision to pass or fail a Criminalist, then the Nuclear DNA Technical Leader shall make the final decision after consulting with the examination committee and conducting a mini-examination of the Criminalist which may include technical and factual questions. The Criminalist has the right to appeal any decision to the Nuclear DNA Technical Leader, the Deputy Director, and/or the Director. All appeals must be made in writing and filed within five (5) days of the examination committee's decision.

Each Criminalist shall have a maximum of two attempts to pass the full examination. At the examination committee's discretion, the Criminalist shall have up to two attempts to remediate each full examination. However, the committee is not obligated to grant any remediations. The Criminalist will be notified at the end of the examination/remediation of the committee's decision.

If a Criminalist has not passed the full examination after two attempts, then the Criminalist may be subject to transfer to a different title, demotion to a Criminalist, Level I title, or termination.

Oral Examination Procedures

EVENT	REQUIRED ATTENDANCE	POSSIBLE OUTCOMES
First oral exam	Criminalist, supervisor, and Examiner	• Pass with no remediation • Requires remediation • Fail – Committee decides no remediation feasible. • Stopped exam – Committee decides that the test should not be continued. This is considered a failed exam.
First remediation	Criminalist and Examiner	• Pass • Requires second remediation • Fail – Committee decides no remediation feasible.
Second remediation	Criminalist, Supervisor, Examiner, and Assistant director	• Pass • Fail
Second oral exam	Criminalist, Supervisor, Examiner, and Assistant director	• Pass with no remediation • Requires remediation • Fail – Committee decides no remediation feasible. • Stopped exam – Committee decides that the test should not be continued. This is considered a failed exam.
Failure to pass an oral exam	• For first oral exam, this triggers the second oral exam • For the second oral exam, this shall result in demotion, transfer to another title, or termination.	

KSA's to master

1. Be able to answer a wide variety of technical DNA questions.
2. Be able to answer a wide variety of questions related to QA/QC.

Final actions

None.

MODULE 13A: SEROLOGY MOCK COURT		
DATE EFFECTIVE 04/15/16	APPROVED BY DNA TECHNICAL LEADERS	PAGE 1 OF 1

Required lectures
Basics of the legal system
QA/QC and Accreditation
Serology

Required reading
Study the articles in the online reference folder on this topic.

Practical exercises
To prepare for mock court, the trainee might review court transcripts, suggested questions, reading material concerning expert testimony, and observing laboratory personnel testify in court.

1. As available, attend court with Criminalists and observe testimony.
2. In consultation with your supervisor, select one of your small cases for use in a mock court. Your supervisor and/or designee will be the prosecutor, and the training group and/or other staff members will take the roles of the defense attorney, judge and jury.
3. Review the theoretical and practical aspects of the testing performed in the small case.
4. With your supervisor, go over the questions to be asked in the direct examination and the potential topics to be covered in cross examination.
5. Practice your answers with your supervisor and/or designee and on your own, paying particular attention to making your responses loud, clear, and easily understandable to a lay person. Learn to speak slowly and enunciate carefully, directing your answers towards the jury. Learn to listen carefully to the questions, making sure the question is complete before answering; think before replying.

Competency test
Successfully complete your serology mock court. The attending staff members will critique your performance. Successful completion of the serology mock court will be determined by the staff in attendance, if necessary, a second serology court may be required.

KSA's to be mastered
Demonstrate poise, technical knowledge, ability to convey scientific concepts, and correct interpretation of laboratory results.

Final actions
None

MODULE 13B: DNA MOCK COURT		
DATE EFFECTIVE 04/15/16	APPROVED BY DNA TECHNICAL LEADERS	PAGE 1 OF 2

Required lecture

Basics of the legal system

Required reading

Study the articles in the online reference folder on this topic.

Practical exercises

To prepare for mock court, the trainee might review court transcripts, suggested questions, reading material concerning expert testimony, and observing laboratory personnel testify in court.

1. If available, attend court with Criminalists and observe testimony.
2. In consultation with a supervisor or designee, select a DNA case for use in a mock court. Your supervisor will be the prosecutor, and other staff members will take the roles of the defense attorney, jury and judge.
3. Review the theoretical and practical aspects of the testing performed in the small case.
4. With your supervisor and the training group, go over the questions to be asked in the direct examination and the potential topics to be covered in cross examination.
5. Practice your answers with your supervisor, the training group and on your own, paying particular attention to make your responses loud, clear, and easily understandable to a lay person. Learn to speak slowly and enunciate carefully, directing your answers towards the jury. Learn to listen carefully to the questions, making sure the question is complete before answering; think before replying.

Competency test

Successfully complete the DNA mock court. The DNA mock court should be held no later than two weeks after the completion of training. The attending staff members will critique the performance; the "judge" will provide a written DNA Moot Court Testimony Evaluation Grade. An average grade of 70% or greater must be achieved by the Criminalist in order to pass. An analyst, who does not achieve a passing grade, will be allowed to repeat their DNA moot court, within two weeks, with the same jury panel. If the Criminalist has not passed the DNA moot court after two attempts, then the Criminalist may be subject to demotion or termination.

KSA's to be mastered

Demonstrate poise, technical knowledge, ability to convey scientific concepts, and correct interpretation of laboratory results.

Final actions

File your moot court evaluation in your training folder.

MODULE 14A: STR REVIEW		
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Required lectures

DNA extraction
DNA quantitation
PCR Theory
STR typing
Basics of capillary electrophoresis on the ABI 3130

Required reading

1. Study the articles in the online reference folder on DNA extraction, DNA quantitation, DNA amplification, STR typing, and mixture interpretation.
2. Study the capillary-based DNA methods in the Protocols for Forensic STR Analysis Manual.

Practical exercises

Before beginning this module you must have been an interpreting analyst for a minimum of three months and have completed and passed competencies (if applicable) for DNA extraction (modules 5A-5B), DNA quantitation (module 6), PCR amplification (module 8), 3130xl capillary electrophoresis set up and STR analysis (module 9A-9B), PCR mixture dilution studies (module 10), PCR data interpretation exercise (module 11), the oral exam (module 12) and the Moot Courts (Module 13A-13B).

After observing the procedure and having demonstrated the procedure to the trainer, do the following on the provided STR runs:

1. Review the provided STR run files.
   a. All alleles analyzed including the allelic ladder, positive control, and samples must be correct.
   b. All artifact peaks must have been properly edited and reasons for the edits and reruns must be accurately identified.
   c. The files must have be properly saved and archived.

Those already deemed competent in PCR amplification, ABI 3130 Capillary Electrophoresis set up, STR Analysis and STR Review on other PCR kits, such as MiniFiler, will need to observe one review demonstration and perform one review competency test.

MODULE 14A: STR REVIEW		
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Competency

Successfully review the practical STR runs**.**

KSA's to be mastered

1. Understand the preparation, handling, and function of reagents used for PCR amplification and DNA typing.
2. Understand the use of controls introduced at this stage of DNA typing.
3. Be able to correctly review the edits made to the STR electropherograms, including the correct identification of artifacts and rerun samples.
4. Be able to properly use the instrument and associated computers, and archive data correctly.
5. Understand the theory of PCR, the basics of STR typing, and the basics of capillary electrophoresis.
6. Be able to explain the theory and procedures to someone who does not have a scientific background.

Final actions

1. Discuss the module with a supervisor or designee, including review of results and discussion of theory and practical aspects of module. This may necessitate the direct supervisor observing the trainee demonstrate proper archiving of data.
2. Have a supervisor or designee evaluate the results of the competency test.
3. Have a supervisor or designee document successful completion of the module. *The initials/signature of a supervisor or designee indicates that all exercises have been completed and the correct results have been obtained on the competency test (if applicable).*

MODULE 14B: TECHNICAL REVIEW		
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Module: Technical Review Training

Required lectures:

DNA quantitation
PCR Theory
STR typing
Basics of capillary electrophoresis on the ABI 3130

Required reading

Review the Management Systems Manual

Review the Administrative Manual

Review the Serology Manual.

Review the Protocols for Forensic STR Analysis Manual

Review the Evidence and Case Management Manual

Practical Exercises

Criminalists and Assistant Directors have duties in addition to benchwork and/or supervision. To prepare for these duties, additional training consists of technical reviews.

	Minimum Number of Second Reviews	Review Training
Negative DNA Case File Review	5	Criminalist II and above
Positive DNA Case File Review	10	Criminalist III and above
Enhanced DNA Case File Review	10	Assistant Director*

**An experienced Assistant Director, Deputy Director or Director must conduct a second technical review.*

MODULE 14B: TECHNICAL REVIEW		
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Competency Test:

None

KSA's to be mastered:

1. Be able to perform technical review on all case types.

2. Be able to supervise Criminalists including review of case records, reports, training, and time and leave issues. *(Criminalist IV's and Assistant Directors only)*

Other formal supervisory training (courses, lectures, workshops, etc.) will be offered as available.

Final Actions:

1. Discuss the module with your direct supervisor.
2. Supervisor or designee documents completion on all required second reviews.

MODULE 15: MITOCHONDRIAL DNA HAIR EXTRACTION		
DATE EFFECTIVE 04/15/16	APPROVED BY DNA TECHNICAL LEADERS	PAGE 1 OF 2

Required lectures

mtDNA lecture

Required reading

1. Study articles on this topic.
2. Study the mtDNA Hair extraction in the Protocols for Forensic Mitochondrial DNA Analysis Manual.

Practical exercises

The practice samples provided for extraction may be used for all subsequent mtDNA practice exercises.

When you run analytical procedures during training or receive samples for competency testing, document and create records as if you were working on a real case.

After observing the procedure, perform the following method:

1. Organic extraction of two hair samples, one of which can be your own hair.

A separate extraction negative should be extracted with each hair sample. Create a duplex amplification batch sheet.

Competency test

The competency test samples provided for extraction may be used for all subsequent mtDNA competency tests.

Each of three hair samples must be washed and extracted. A separate extraction negative should be extracted with each hair sample. Create a duplex amplification batch sheet. No quantitation needs to be performed, as the maximum amount of DNA will be submitted to amplification.

Note: Competency in either the organic extraction or bone extraction procedures will satisfy the competency requirements for the mitochondrial DNA hair extraction procedure.

KSA's to be mastered

1. Be able to properly document hair using the Mideo system, digital camera and LIMS.
2. Be able to perform washing, digestion, and organic extraction on hair shafts.
3. Understand the preparation, handling, and function of reagents used for mtDNA hair extraction.
4. Understand the use of controls introduced at this stage of DNA typing.
5. Be able to explain the theory and how these tests are run to someone who does not have a scientific background.

Final actions

1. Discuss the module with your direct supervisor, including review of results and discussion of theory and practical aspects of module.
2. Have your supervisor evaluate the results of the competency test.
3. Have your supervisor document successful completion of the module. *The initials/signature of the supervisor indicates that all practical exercises have been completed and the correct results have been obtained on the competency test (if applicable).*

MODULE 17: MITOCHONDRIAL DNA AGILENT ANALYSIS		
DATE EFFECTIVE 07-16-2012	APPROVED BY DNA TECHNICAL LEADERS	PAGE 1 OF 2

Required lecture

mtDNA lecture

Required reading

1. Study articles on this topic.
2. Study the mtDNA Agilent methods in the mtDNA manual.

Practical exercises

The practice samples provided for extraction are used for all subsequent mtDNA practice exercises. Sample extracts may also be provided directly for analysts training in Agilent.

When you run analytical procedures during training or receive samples for competency testing, document and create records as if you were working on a real case.

After observing the procedure, perform the following method:

1. Quantitate the amplification product using the Agilent bioanalyzer.
2. Review all records created.
3. Using the quantitation values obtained for practice samples, calculate and fill out a cycle-sequencing batch sheet.

Review the results with the supervisor before continuing.

Competency test

The competency test samples provided for extraction are used for all subsequent mtDNA competency tests. Sample extracts may also be provided directly for analysts training in Agilent.

Agilent run must pass. Usable value for cycle-sequencing must be obtained for all samples (samples requiring requantitation, must be requantified).

KSA's to be mastered

1. Be able to perform Agilent quantitation.
2. Understand the preparation, handling, and function of reagents used for Agilent.
3. Understand the sensitivity and limitations of Agilent.
4. Be able to explain the theory and how this test is run to someone who does not have a scientific background.
5. Be able to correctly interpret Agilent results, make any necessary calculations, and submit proper amounts for cycle-sequencing. Understand the relationship between the Agilent value of a sample, and the amount of mtDNA submitted for cycle-sequencing.

Final actions

1. Discuss the module with your direct supervisor, including review of results and discussion of theory and practical aspects of module.
2. Have your supervisor evaluate the results of the competency test.
3. Have your supervisor document successful completion of the module. *The initials/signature of the supervisor indicates that all practical exercises have been completed and the correct results have been obtained on the competency test (if applicable).*

MODULE 18: MITOCHONDRIAL DNA SEQUENCING		
DATE EFFECTIVE 07-16-2012	APPROVED BY DNA TECHNICAL LEADERS	PAGE 1 OF 2

Required lecture

mtDNA lecture

Required reading

1. Study articles on this topic.
2. Study the sequencing methods in the Protocols for Forensic Mitochondrial DNA Analysis Manual.

Practical exercises

The practice samples provided for extraction may be used for all subsequent mtDNA practice exercises.

When you run analytical procedures during training or receive samples for competency testing, document and create records as if you were working on a real case.

After observing the procedure, perform the following methods:

1. ExoSAP-IT Digestion
2. Cycle Sequencing
3. SDS treatment
4. Centrisep cleanup
5. Evaporation

Create a cycle sequencing batch sheet and aliquot correct amounts of ExoSap-IT. Aliquot the correct amounts of template DNA and water and cycle sequence with necessary primers. Perform SDS cleanup and Centrisep on all samples.

After evaporation and re-suspension of samples in formamide, load samples onto the ABI 3130.

Criminalist I trainees and above will perform their own 3130 runs.

Competency test

The competency test samples provided for extraction may be used for all subsequent mtDNA competency tests.

KSA's to be mastered

1. Be able to correctly create cycle sequencing batch sheets.
2. Understand the preparation, handling, and function of reagents used for ExoSAP-IT, mtDNA cycle sequencing, SDS cleanup, and Centrisep cleanup.
3. Be able to select correct primers to meet mtDNA cycle sequencing requirements.
4. Understand the theory of sequencing and the different types of chemistries available.
5. Be able to explain the theory to someone who does not have a scientific background.

Final actions

1. Discuss the module with your direct supervisor, including review of results and discussion of theory and practical aspects of module.
2. Have your supervisor evaluate the results of the competency test.
3. Have your supervisor document successful completion of the module. *The initials/signature of the supervisor indicates that all practical exercises have been completed and the correct results have been obtained on the competency test (if applicable).*

MODULE 19: MITOCHONDRIAL DNA DATA INTERPRETATION (COMPUTER EXERCISE)

Required lecture

mtDNA lecture

Required reading

1. Study the articles on this topic
2. Study the section describing the use of Sequencher in the Protocols for Forensic Mitochondrial DNA Analysis Manual.

Practical exercises

Criminalist II trainees and above will analyze their own previously run sequencing reactions.

In addition, the trainer will provide the trainee with sequence data for five sample sets. For each sample set, the trainee should determine if the controls are of good quality, if sequence data meets current guidelines, assemble the sequence data into contigs using the Sequencher software program, and make any appropriate edits on the Sequence Analysis Editing Sheet. The trainee must also assemble the appropriate documention for each contig built and be able to electronically archive the sequence data on the mtDNA server. Finally, a report including statistics (when applicable) should be compiled for the ten sample sets.

Competency test

The competency test samples provided for extraction may be used for the sequencing analysis and data interpretation competency tests.

KSA's to be mastered

1. Be able to assemble and edit mtDNA sequencing electropherograms.
2. Be able to evaluate initial mtDNA results and determine what further testing might be needed.
3. Be able to determine the proper statistical information for each mtDNA type.

Final actions

1. Discuss the module with your direct supervisor, including review of results and discussion of theory and practical aspects of module.
2. Have your supervisor sign off on successful completion of module. *The initials/signature of the supervisor indicates that all practical exercises have been completed and the correct results have been obtained on the competency test (if applicable).*

MODULE 20: MITOCHONDRIAL DNA MOCK COURT		
DATE EFFECTIVE 04/15/16	APPROVED BY DNA TECHNICAL LEADERS	PAGE 1 OF 1

Required lecture

none

Required reading

Transcripts available in-house from past trials involving mtDNA analysis.

Practical exercises

To prepare for mock court, the trainee should review (i) court transcripts, (ii) suggested questions, (iii) reading material concerning expert testimony, and when possible should observe laboratory personnel testify in court.

1. As available, attend court with Criminalists and observe testimony.
2. In consultation with your supervisor, select one of your mtDNA cases for use in a mock court. Your supervisor will be the prosecutor, and other staff members will take the roles of the defense attorney and judge.
3. Review the theoretical and practical aspects of the testing performed in the small case.
4. With your supervisor, go over the questions to be asked in the direct examination and the potential topics to be covered in cross examination.
5. Practice your answers with your supervisor and on your own, paying particular attention to make your responses loud, clear, and easily understandable to a lay person. Learn to speak slowly and enunciate carefully, directing your answers towards the jury. Learn to listen carefully to the questions, making sure the question is complete before answering; think before replying.

Competency test

Successfully complete your DNA mock court. The attending staff members will critique your performance; the "judge" will provide a written Court Testimony Evaluation Grade.

KSA's to be mastered

Demonstrate poise, technical knowledge, ability to convey scientific concepts, and correct interpretation of laboratory results.

Final actions

Have your supervisor document successful completion of the module.

MODULE 21: ORGANIC EXTRACTION		
DATE EFFECTIVE 04/15/16	APPROVED BY DNA TECHNICAL LEADERS	PAGE 1 OF 2

Required lecture

DNA extraction

Required reading

1. Study the articles in the online reference folder on this topic.
2. Study the DNA extraction methods in the Protocols for Forensic STR Analysis Manual.

Practical exercises

When you run analytical procedures during training or receive samples for competency testing, document and create records as if you were working on a real case.

After observing the procedure and having demonstrated the procedure to the trainer, do the following experiments.

1. Perform an organic extraction on saliva or known blood samples.

As each extraction is finished, submit aliquots for DNA quantitation. Review the results with a supervisor or designee; once satisfactory results are obtained on the practice samples, perform extractions on the competency test samples. Submit aliquots of competency test samples for DNA quantitation.

Competency test

Each sample must yield a typable amount of DNA, as determined by the current quantitation method used. Each extraction set must have a clean extraction negative, as determined by the current quantitation method used and PCR analysis. Each sample result must either give the correct full DNA profile or achieve source attribution in the PCR system(s) tested.

KSA's to be mastered

1. Be able to perform an organic extraction.
2. Understand the preparation, handling, and function of reagents used for DNA extraction.
3. Be able to properly aliquot samples for Quantitation.
4. Understand the use of controls introduced at this stage of DNA typing.
5. Be able to explain the theory and procedure to someone who does not have a scientific background.

Final actions

1. Discuss the module with a supervisor or designee, including review of results and discussion of theory and practical aspects of module.
2. Have a supervisor or designee evaluate the results of the competency test.
3. Have a supervisor or designee document successful completion of the module. *The initials/signature of a supervisor or designee indicates that all practical exercises have been completed and the correct results have been obtained on the competency test (if applicable).*

MODULE 22: LCN EXTRACTION		
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Required lecture

DNA extraction

Required reading

1. Study the articles in the online reference folder on this topic.
2. Study the DNA extraction methods in the Protocols for Forensic STR Analysis Manual.

Practical exercises

When you run analytical procedures during training or receive samples for competency testing, document and create records as if you were working on a real case.

After observing the procedure and having demonstrated the procedure to the trainer, do the following experiments.

1. Perform an LCN extraction on provided samples.

As each extraction is finished, submit aliquots for DNA quantitation. Review the results with a supervisor or designee; once satisfactory results are obtained on the practice samples, perform extractions on the competency test samples. Submit aliquots of competency test samples for DNA quantitation.

Competency test

Each sample must yield a typable amount of DNA, as determined by the current quantitation method used. Each extraction set must have a clean extraction negative, as determined by the current quantitation method used and PCR analysis. Each sample result must either give the correct full DNA profile or achieve source attribution in the PCR system(s) tested.

KSA's to be mastered

1. Be able to perform an LCN extraction.
2. Understand the preparation, handling, and function of reagents used for DNA extraction.
3. Be able to properly aliquot samples for Quantitation.
4. Understand the use of controls introduced at this stage of DNA typing.
5. Be able to explain the theory and procedure to someone who does not have a scientific background.

Final actions

1. Discuss the module with a supervisor or designee, including review of results and discussion of theory and practical aspects of module.
2. Have a supervisor or designee evaluate the results of the competency test.
3. Have a supervisor or designee document successful completion of the module. *The initials/signature of a supervisor or designee indicates that all practical exercises have been completed and the correct results have been obtained on the competency test (if applicable).*

MODULE 23: IDENTIFILER 31 STR ANALYSIS		
DATE EFFECTIVE 04/15/16	APPROVED BY DNA TECHNICAL LEADERS	PAGE 1 OF 3

Required lectures

PCR theory
STR typing
Basics of capillary electrophoresis on the ABI 3130*xl*

Required reading:

1. Study the procedures described in the Protocols for Forensic STR Analysis Manual regarding amplification and analysis with Identifiler™ reagents for both 28 and 31 cycles.
2. Review the required readings in the online reference folder pertaining to the use application of Identifiler™ with both HT-DNA and LT-DNA samples.
3. Review the training lecture pertaining to the validation and application of Identifiler™ for both HT-DNA and LT-DNA samples at the Department of Forensic Biology

Practical Exercises:

1. Observe a trained analyst analyze at minimum 5 STR runs consisting of:
   a) 1 injection of Identifiler™ (ID) controls
   b) 2 normal ID31 injections
   c) 2 reruns associated with the 2 normal runs previously observed for category b

   The trainer will demonstrate all the procedures used for ID31 sample analysis including the scheduling of reruns.

2. Training sets are available in the M:\HighSens_Data\TRAINING folder in a subfolder named "ID31 Analysis Training Runs". Two sets of runs are available to choose from.

   Using the practice FSA files analyze an injection from each of the following runs under observation
   a) ID31 controls
   b) ID31 samples initially run at the high injection parameter
   c) ID31 samples injected at normal injection parameters
   d) ID31 reruns originating from the injections from category 3

Using the practice FSA files analyze an injection from each of the following runs independently:

a) ID31 controls
b) ID31 samples initially run at the high injection parameter
c) ID31 samples injected at normal injection parameters
d) ID31 reruns originating from the injections from category 3

During the observation and analysis practice runs, record edits and document as if you were working on casework samples.

Ensure you understand the assignment of basepairs and alleles to peaks according to the LIZ-500 standard, and the Identifiler™ allelic ladder, respectively. Become familiar with the positions of the Identifiler™ loci. Recognize the peaks of the positive control amplified with Identifiler™. Distinguish allele peaks from artifacts.

Become familiar with the ID31 analysis and interpretation rules for the purpose of evaluating negative controls and generation of composite profiles during STR analysis rotations. Additionally, the analyst will be familiarized with the control review and profile documentation for each injection.

If desired, practice analysis of samples amplified with Identifiler™ further. Review the results of the practical exercises samples with your supervisor; once satisfactory results are obtained, perform analysis on the competency test runs. If your supervisor feels that additional work is necessary, it should be completed before continuing.

Competency:

Analyze and edit the provided competency FSA files. All alleles assigned including the allelic ladder, positive control, and samples must be correct. All artifact peaks must be properly edited and the reasons for the edits must be accurately identified.

Using the practice FSA files analyze an injection from each of the following runs independently:

1. ID31 controls
2. ID31 samples initially run at the high injection parameter
3. ID31 samples injected at normal injection parameters
4. ID31 reruns originating from the injections from category 3

KSA's to be mastered

1. Acquire the skill to analyze FSA files of samples amplified with Identifiler™ for ID31.
2. Understand the sizing of peaks using the LIZ-500 size standard.
3. Understand the assignment of alleles according to the Identifiler™ allelic ladder.
4. Be able to accurately identify artifacts and true peaks in an electropherogram of samples amplified with Identifiler™.
5. Be able to generate statistics from an Identifiler™ profile.

Final actions

1. Discuss the module with your direct supervisor, including review of results and discussion of theory and practical aspects of module.
2. Have your supervisor evaluate the results of the practical exercises.
3. Have your supervisor document successful completion of the module. *The initials/signature of the supervisor indicates that all practical exercises have been completed and the correct results have been obtained on the competency test (if applicable).*

MODULE 24: MINIFILER ANALYSIS		
DATE EFFECTIVE 04/15/16	APPROVED BY DNA TECHNICAL LEADERS	PAGE 1 OF 3

Required lectures

PCR theory
STR typing
Basics of capillary electrophoresis on the ABI 3130*xl*

Required reading

1. Study the articles in the online reference folder on this topic.
2. Study the capillary-based DNA methods in the Protocols for Forensic STR Analysis Manual.

Practical exercises

When you run analytical procedures during training or receive samples for competency testing, document and create records as if you were working on a real case.

After observing the procedure and having demonstrated the procedure to the trainer, do the following experiments.

1. Analyze the data for all practice samples* using the current MiniFiler analysis system.
2. Edit all practice samples using current accepted guidelines.

Review the results with a supervisor or designee; once correct PCR typing and editing results are obtained on the practice samples, analyze and edit the competency test samples using the current MiniFiler analysis system.

Submit the PCR typing results for review to a supervisor or designee. If a supervisor or designee feels that additional work is necessary, it should be completed before continuing. Once all work is completed and passed, continue to the last part of analytical training.

* Those already deemed competent in Extraction, PCR amplification and ABI 3130*xl* Capillary Electrophoresis Set Up will be provided with STR runs for analysis training. The runs can be found in:
M:\FBIOLOGY_MAIN\TRAINING\Interpretations Reviews and Exercises\STR Analysis

Competency test

The competency test samples provided for extraction* are used for all subsequent DNA competency tests.

The DNA typing results must be correct. Extraction and amplification negatives must give clean results. Samples must yield complete profiles. All alleles assigned including the allelic ladder, positive control, and samples must be correct. All artifact peaks must be properly edited and the reasons for the edits must be accurately identified.

* Those already deemed competent in Extraction, PCR amplification and ABI 3130*xl* Capillary Electrophoresis Set Up will be provided with STR runs for analysis training. The runs can be found in:
M:\FBIOLOGY_MAIN\TRAINING\Interpretations Reviews and Exercises\STR Analysis

Those already deemed competent in PCR amplification and ABI 3130*xl* Capillary Electrophoresis on other PCR kits, such as Identifiler, will need to observe one demonstration, perform one observed practice and a competency test in the MiniFiler PCR system. The training group will provide analysis sets for practice and competency.

KSA's to be mastered

1. Understand the preparation, handling, and function of reagents used for PCR amplification and DNA typing.
2. Understand the use of controls introduced at this stage of DNA typing.
3. Be able to amplify and type samples in all DNA systems used in casework.
4. Be able to correctly edit electropherograms, including the correct identification of artifacts.
5. Be able to properly use the instrument and associated computers, and archive data correctly.
6. Understand the theory of PCR, the basics of STR typing, and the basics of capillary electrophoresis.
7. Be able to explain the theory and procedure to someone who does not have a scientific background.

Final actions

1. Discuss the module with a supervisor or designee, including review of results and discussion of theory and practical aspects of module. This may necessitate a supervisor or designee observing the trainee demonstrate proper archiving of data.

2. Have a supervisor or designee evaluate the results of the competency test.
3. Have a supervisor or designee document successful completion of the module. *The initials/signature a supervisor or designee indicates that all practical exercises have been completed and the correct results have been obtained on the competency test (if applicable).*

MODULE 2A: SEROLOGY – BLOOD PRESUMPTIVE TESTS		
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Required lecture
Serology

Required reading
1. Study the articles in the online reference folder on this topic.
2. Study the tests for blood in the Serology Manual.

Practical exercises
When you run analytical procedures during training or receive samples for competency testing, take notes and fill out worksheets as if you were working on a real case. After observing each procedure and having demonstrated each procedure to the trainer, do the following experiments.

1. Sensitivity. Check this for the KM presumptive test by testing serial dilutions of blood up to 1/1,000,000.
2. Specificity. Check this for KM reagent by testing various substances; may include but not limited to sweat, urine, soy sauce, ketchup, cosmetic products, rust, various species samples, etc.

Competency test
Blood Presumptive competency test

KSA's to be mastered
1. Be able to perform the blood presumptive tests.
2. Understand the composition of blood, both its cellular components and protein makeup (including hemoglobin).
3. Understand the mechanisms of the presumptive tests for blood employed in the laboratory.
4. Understand which substances cross-react with which presumptive test and why.
5. Understand the sensitivity and limitations of the KM test.
6. Understand the reasons and use of controls for this procedure.
7. Be able to explain the theory and procedure to someone who does not have a scientific background.

Final actions
1. Discuss the module with a supervisor or designee, including review of results and discussion of theory and practical aspects of module.
2. Have a supervisor or designee document successful completion of the module. *The initials/signature of supervisor or designee indicates that all practical exercises have been completed and the correct results have been obtained on the competency test (if applicable).*

MODULE 2B: SEROLOGY – ACID PHOSPHATASE PRESUMPTIVE TESTS		
DATE EFFECTIVE 04/15/16	APPROVED BY DNA TECHNICAL LEADERS	PAGE 1 OF 1

Required lecture
Serology

Required reading
1. Study the articles in the online reference folder on this topic.
2. Study the tests for blood in the Serology Manual.

Practical exercises
When you run analytical procedures during training or receive samples for competency testing, take notes and fill out worksheets as if you were working on a real case. After observing each procedure and having demonstrated each procedure to the trainer, do the following experiments.

1. Sensitivity. Using the acid phosphatase test, test various serial dilutions of semen extracts up to 1/1,000,000.
2. Specificity. Check for specificity of the acid phosphatase by testing various substances; may include but not limited to sweat, urine, vaginal fluid, saliva, etc.

Competency test
Acid Phosphatase competency test

KSA's to be mastered
1. Be able to perform the acid phosphatase presumptive tests.
2. Understand the composition of semen.
3. Understand the mechanisms of the presumptive tests for semen employed in the laboratory: Acid Phosphatase (AP).
4. Understand which substances cross-react with which presumptive test and why.
5. Understand the sensitivity and limitations of the AP test.
6. Understand the reasons and use of controls for this procedure.
7. Be able to explain the theory and procedure to someone who does not have a scientific background.

Final actions
1. Discuss the module with a supervisor or designee, including review of results and discussion of theory and practical aspects of module.
2. Have a supervisor or designee document successful completion of the module. *The initials/signature of a supervisor or designee indicates that all practical exercises have been completed and the correct results have been obtained on the competency test (if applicable).*

MODULE 2C: SEROLOGY –SPERM SEARCH		
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Required lecture

Serology

Required reading

1. Study the articles in the online reference folder on this topic.
2. Study the tests for semen in the Serology Procedures Manual.

Practical exercises

When you run analytical procedures during training or receive samples for competency testing, take notes and fill out worksheets as if you were working on a real case. After observing each procedure and having demonstrated each procedure to the trainer, do the following experiments.

1. Prepare semen-stained and semen-free slides. Stain these slides using the Christmas Tree stain procedure. Identify the presence or absence of sperm.

Competency test

Correctly identify the presence or absence of sperm on each provided slide.

KSA's to be mastered

1. Be able to perform the Christmas Tree stain.
2. Understand the components of seminal fluid, including human sperm morphology. Get a general feeling about the how sperm morphology differs in various animals.
3. Understand why sperm exhibit differential staining.
4. Understand the persistence of the components of semen in the oral, anal, and vaginal tracts and why the length of time differs.
5. Be able to explain the theory and procedures to someone who does not have a scientific background.

Final actions

1. Discuss the module with a supervisor or designee, including review of results and discussion of theory and practical aspects of module.

2. Have a supervisor or designee evaluate the results of the competency test.
3. Have a supervisor or designee document successful completion of the module. *The initial/signature of a supervisor or designee indicates that all practical exercises have been completed and the correct results have been obtained on the competency test (if applicable).*

MODULE 2D: SERATEC PSA		
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Required lecture

Serology

Required reading

1. Study the articles in the online reference folder on this topic.
2. Study the Seratec PSA test in the Serology Manual section

Practical exercises

When you run analytical procedures during training or receive samples for competency testing, document and create records as if you were working on a real case.

After observing the procedure and having demonstrated the procedure to the trainer, do the following experiments.

1. Specificity. Check for specificity of the Seratec PSA by testing various substances; may include but not limited to sweat, urine, vaginal fluid, saliva, etc.

2. Sensitivity. Using various dilutions of semen extracts up to 1/1000 test the sensitivity of the Seratec PSA test.

Competency test

Obtain a semen identification competency test. The presence or absence of PSA in each sample must be correctly determined.

KSA's to be mastered

1. Be able to perform the Seratec PSA test.
2. Be able to correctly interpret Seratec PSA results.
3. Understand the sensitivity and limitations of the Seratec PSA test.
4. Understand how the Seratec PSA test works.
5. Be able to explain the theory and how these tests to someone who does not have a scientific background.

Final actions

1. Discuss the module with a supervisor or designee, including review of results and discussion of theory and practical aspects of module.
2. Have a supervisor or designee evaluate the results of the competency test.
3. Have a supervisor or designee document successful completion of the module. *The initials/signature of a supervisor or designee indicates that all practical exercises have been completed and the correct results have been obtained on the competency test (if applicable).*

MODULE 2E: SEROLOGY – AMYLASE		
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Required lecture

Serology

Required reading

1. Study the articles in the online reference folder on this topic.
2. Study the tests for Seratec amylase in the Serology Manual.

Practical exercises

When you run analytical procedures during training or receive samples for competency testing, document and create records as if you were working on a real case.

After observing each procedure and having demonstrated each procedure to the trainer, do the following experiments.

1. Specificity. Check the specificity of the Seratec Amylase test by testing various substances; may include but not limited to sweat, urine, vaginal fluid, saliva, etc.

2. Sensitivity. Using various dilutions of saliva extracts up to 1/1000 test the sensitivity of the Seratec Amylase test.

Competency tests

Amylase identification competency test. The presence or absence of amylase in each sample must be correctly determined.

KSA's to be mastered

1. Be able to perform the Seratec Amylase test.
2. Be able to properly interpret the test for different sample types.
3. Understand the sensitivity and limitations of the Seratec Amylase test.
4. Understand the use of controls for the Seratec Amylase test.
5. Understand the difference between AMY1 and AMY2 and in which body fluids each is found
6. Understand how the Seratec Amylase test works.
7. Be able to explain the theory and procedure to someone who does not have a scientific background.

Final actions

1. Discuss the module with a supervisor or designee, including review of results and discussion of theory and practical aspects of module.
2. Have a supervisor or designee evaluate the results of the competency test.
3. Have a supervisor or designee document successful completion of the module. *The initials/signature of a supervisor or designee indicates that all practical exercises have been completed and the correct results have been obtained on the competency test (if applicable).*

MODULE 3: EVIDENCE EXAMINATION		
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Required lectures
Serology

Required reading
1. Study the articles in the online reference folder on these topics.
2. Study the note taking section of the Evidence and Case Management Manual.
3. Study the tests for blood and semen in the Serology Manual.

Practical exercises

Before beginning this module you must have completed and passed competencies (if applicable) for Basic Laboratory Techniques (module 1), Serology Blood (module 2A), Serology Acid Phosphatase (module 2B), Serology Sperm (module 2C), Serology Seratec PSA (module 2D) and Serology Seratec PSA (module 2E).

1. During the first week of training, observe several Criminalists examining evidence on various case types.
2. During the second week of training practice evidence examination using mock evidence, provided by the Training Team, while being observed by Criminalist trainers.

Competency Test

Successfully examine mock evidence.

KSA's required to be mastered

1. Understand target dates, how cases are assigned, and how records are filled out for case tracking purposes.
2. Understand the importance of chain of custody records for evidence sign-out, return to the Evidence Unit, and the documentation of retained items.
3. Understand the need to thoroughly examine and analyze evidence items based on the scheduled analysis, including the use of evidence packaging records, clothing description records, notes, diagrams, and photography as needed.
4. Understand policies regarding controls, retention of samples, and submission of samples.

Final actions

1. Discuss the module with a supervisor or designee, including review of results and discussion of theory and practical aspects of module.
2. Have a supervisor or designee document successful completion of the module. *The initials/signature of a supervisor or designee indicates that all practical exercises have been completed and the correct results have been obtained on the competency test (if applicable).*

MODULE 4: SEXUAL ASSAULT KITS		
DATE EFFECTIVE 04/15/16	APPROVED BY DNA TECHNICAL LEADERS	PAGE 1 OF 2

Required lecture

Standardized Sexual Assault Evidence Collection Kits
Serology

Required reading

1. Study the articles in the online reference folder on this topic.
2. Study the sexual assault kit processing and flow chart in the Evidence and Case Management Manual.
3. Study the Christmas Tree staining and Seratec PSA and Amylase procedures in the Serology Manual.
4. Study body fluid identification in the Serology Manual.

Practical exercises

Before beginning this module you must have completed and passed competencies (if applicable) in the following modules: basic laboratory techniques (module 1) and serology modules: blood (module 2A), acid phosphatase (module 2B), sperm search (module 2C) Seratec PSA (module 2D) and Seratec Amylase (module 2E).

1. Observe a Criminalist processing at least two sexual assault kits

2. Demonstrate the processing of at least three sexual assault kits for the trainer, including preparation of stained slides and (if applicable) examination of underwear or other small clothing item.

Competency test

none

KSA's to be mastered

1. Understand target dates, how cases are assigned, and documentation used for case tracking purposes.
2. Be able to thoroughly examine and analyze a sexual assault kit based on the scheduled analysis.
3. Be able to document chain of custody records for evidence sign-out, return to the Evidence Unit, and for documentation of retained items.
4. Understand the purpose of each sexual kit component.
5. Be able to explain the theory and tests performed to someone who does not have a scientific background.

Final actions

1. Discuss the module with a supervisor or designee, including review of results and discussion of theory and practical aspects of module.
2. Have a supervisor or designee evaluate the case records and the report.
3. Have a supervisor or designee document successful completion of the module. *The initials/signature of a supervisor or designee indicates that all practical exercises have been completed and the correct results have been obtained on the competency test (if applicable).*

MODULE 5A: CHELEX EXTRACTION		
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Required lecture

DNA extraction

Required reading

1. Study the articles in the online reference folder on this topic.
2. Study the DNA extraction methods in the Protocols for Forensic STR Analysis Manual.

Practical exercises

When you run analytical procedures during training or receive samples for competency testing, document and create records as if you were working on a real case.

After observing the procedure and having demonstrated the procedure to the trainer, do the following experiments.

1. Chelex extraction

After the extraction is finished aliquot all the samples for DNA quantitation. Review the results with your supervisor or designee.

Competency test

Once satisfactory results are obtained on the practice samples, perform the following competency:

1. Chelex extraction on the competency test samples.

Submit aliquots of competency test samples for DNA quantitation.

Each sample must yield an amplifiable amount of DNA, as determined by the current quantitation method used. Each extraction set must have a clean extraction negative, as determined by the current quantitation method used and PCR analysis.

For manual differential extractions the male donor to the sperm fraction must either be single source or the major donor of the fraction. For differential extractions the female donor to the epithelial fraction must either be a single source or the major donor of the fraction. The SR can

be a mixture of the donors. Each sperm and epithelial fraction sample result must either give the correct full DNA profile or achieve source attribution in the PCR system(s) tested.

KSA's to be mastered

1. Be able to perform Chelex extraction.
2. Understand the preparation, handling, and function of reagents used for DNA extraction.
3. Be able to properly aliquot samples for Quantitation.
4. Understand the use of controls introduced at this stage of DNA typing.
5. Be able to explain the theory and procedures to someone who does not have a scientific background.

Final actions

1. Discuss the module with your direct supervisor or designee, including review of results and discussion of theory and practical aspects of module.
2. Have your supervisor or designee evaluate the results of the competency test.
3. Have your supervisor document successful completion of the module. *The initials/signature of the supervisor or designee indicates that all practical exercises have been completed and the correct results have been obtained on the competency test (if applicable).*

MODULE 5B: MAG ATTRACT EXTRACTION		
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Required lecture

DNA extraction

Required reading

1. Study the articles in the online reference folder on this topic.
2. Study the DNA extraction methods in the Protocols for Forensic STR Analysis Manual.

Practical exercises

When you run analytical procedures during training or receive samples for competency testing, document and create records as if you were working on a real case.

After observing the procedure and having demonstrated the procedure to the trainer, do the following experiments.

1. Perform an M48 extraction.

As each extraction is finished, submit aliquots for DNA quantitation. Review the results with the supervisor or designee.

Competency test

Once satisfactory results are obtained on the practice samples, perform the following competency:

1. Perform an M48 extraction.

Submit aliquots of competency test samples for DNA quantitation.

Each appropriate sample must yield an amplifiable amount of DNA, as determined by the current quantitation method used. Each extraction set must have a clean extraction negative, as determined by the current quantitation method used and PCR analysis. Each sample result must either give the correct full DNA profile or achieve source attribution in the PCR system(s) tested.

KSA's to be mastered

1. Be able to perform an M48 extraction on all sample types.
2. Understand the preparation, handling, and function of reagents used for DNA extraction.
3. Be able to properly aliquot samples for Quantitation.
4. Understand the use of controls introduced at this stage of DNA typing.
5. Be able to explain the theory and procedures to someone who does not have a scientific background.

Final actions

1. Discuss the module with your direct supervisor or designee including review of results and discussion of theory and practical aspects of module.
2. Have your supervisor or designee evaluate the results of the competency test.
3. Have your supervisor or designee document successful completion of the module. *The initials/signature of the supervisor or designee indicates that all practical exercises have been completed and the correct results have been obtained on the competency test (if applicable).*

MODULE 5C: DIFFERENTIAL EXTRACTION BY QIACUBE AND EZ1

Required lecture

DNA extraction

Required reading

1. Study the articles in the online reference folder on this topic.
2. Study the DNA extraction methods in the Protocols for Forensic STR Analysis Manual.

Practical exercises

When you run analytical procedures during training or receive samples for competency testing, document and create records as if you were working on a real case.

After observing the procedure and having demonstrated the procedure to the trainer, do the following experiments.

1. Differential extraction by QIAcube and EZ1

After the extraction is finished aliquot all the samples for DNA quantitation. Review the results with your supervisor or designee.

Competency test

Once satisfactory results are obtained on the practice samples, perform the following competency:

1. Differential extraction by QIAcube and EZ1 on competency test samples

Each sample must yield an amplifiable amount of DNA, as determined by the current quantitation method used. Each extraction set must have a clean extraction negative, as determined by the current quantitation method used and PCR analysis.

For differential extractions the male donor to the sperm fraction must either be single source or the major donor of the fraction. For differential extractions the female donor to the epithelial fraction must either be a single source or the major donor of the fraction. Each sperm and epithelial fraction sample result must either give the correct full DNA profile or achieve source attribution in the PCR system(s) tested.

KSA's to be mastered

1. Be able to perform QIAcube and EZ1 extractions
2. Understand the preparation, handling, and function of reagents used for DNA extraction.
3. Be able to properly aliquot samples for Quantitation.
4. Understand the use of controls introduced at this stage of DNA typing.
5. Be able to explain the theory and procedures to someone who does not have a scientific background.

Final actions

1. Discuss the module with your direct supervisor or designee including review of results and discussion of theory and practical aspects of module.
2. Have your supervisor or designee evaluate the results of the competency test.
3. Have your supervisor or designee document successful completion of the module. *The initials/signature of the supervisor or designee indicates that all practical exercises have been completed and the correct results have been obtained on the competency test (if applicable).*

Lab-Wide Implementation Training

For the Januaray – April 2016 training of the laboratory analysts who are previously trained in Chelex Differentials and M48 robotic extractions the following steps will be taken for their training.

1. Demo of the QIAcube will be performed with the Demo procedure
2. Samples for the Observed, Independent, and Competencies will be as follows:
   - Eneg1
   - Sample 1: Female buccal specimen
   - Sample 2: Blank labeled to appear as a sample
   - Sample 3: Neat Semen
3. The samples will be Quantitated by Trio for analysis
4. A passing extraction will be deemed by quant results as follows:
   - Eneg1 SF: passing negative values for Quant
   - Eneg1 EC: passing negative values for Quant
   - Sample 1 SF: Little to no DNA detected in SA and no DNA in Y target
   - Sample 1 EC: DNA detected in SA and no DNA detected in Y target
   - Sample 2 SF: passing negative values for Quant
   - Sample 2 EC: passing negative values for Quant
   - Sample 3 SF: DNA detected in both SA and Y target
   - Sample 3 EC: DNA detected in both SA and Y target

MODULE 7: DNA QUANTITATION		
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Required lecture

DNA quantitation

Required reading

1. Study the articles in the online reference folder on this topic.
2. Study the DNA quantitation methods and submission guidelines in the Protocols for Forensic STR Analysis Manual.

Practical exercises

When you run analytical procedures during training or receive samples for competency testing, document and create records as if you were working on a real case.

After observing the procedure and having demonstrated the procedure to the trainer, perform Quantitative Real Time PCR on the samples from the extraction practices.

Review the results with the supervisor or designee. Once satisfactory results are obtained on the practice samples, perform DNA quantitation on the competency test samples. Review the results with your supervisor or designee before continuing.

Competency test

The competency test samples provided for extraction are used for all subsequent DNA competency tests.

The quantitative real time PCR assay must have the slope, R^2, Y intercept and no template control values that are within the allowable ranges.

Submit appropriate aliquots of competency test samples for Microcon and for DNA amplification.

KSA's to be mastered

1. Be able to perform Quantitative Real Time PCR.
2. Understand the preparation, handling, and function of reagents used for DNA quantitation.
3. Understand the use of controls for the Quantitative Real Time PCR test.
4. Understand the sensitivity and limitations of the Quantitative Real Time PCR test.
5. Be able to explain the theory and procedure to someone who does not have a scientific background.
6. Be able to correctly interpret Quantitative Real Time PCR test results, make any necessary calculations, and submit proper amounts for amplification. Understand the relationship between the Quantitative Real Time PCR value of a sample, and the amount of DNA submitted for amplification.

Final actions

1. Discuss the module with your direct supervisor or designee, including review of results and discussion of theory and practical aspects of module.
2. Have your supervisor or designee evaluate the results of the competency test.
3. Have your supervisor or designee sign document successful completion of the module.
   The initials/signature of the supervisor or designee indicates that all practical exercises have been completed and the correct results have been obtained on the competency test (if applicable).

MODULE 7: Microcon		
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Required lecture

DNA extraction
DNA Quantitation

Required reading

1. Study the DNA Microcon methods in the Protocols for Forensic STR Analysis Manual.

Practical exercises

When you run analytical procedures during training or receive samples for competency testing, document and create records as if you were working on a real case.

After observing the procedure and having demonstrated the procedure to the trainer, do the following experiments.

1. Microcon the samples and appropriate extraction negative control from the practice extractions.

After the Microcon is finished calculate the DNA concentration and aliquot the samples for DNA amplification. Review the results with your supervisor or designee.

Competency test

Once satisfactory results are obtained on the practice samples perform the following competency:

1. Microcon the samples and appropriate extraction negative controls of the competency test samples.

Calculate the DNA concentration and submit aliquots of competency test samples for DNA amplification.

Each sample must yield an amplifiable amount of DNA, as determined by the current PCR systems used. Each Microcon set must have a clean Microcon negative, extraction negative, as determined by the current PCR analysis method used.

KSA's to be mastered

1. Be able to perform a Microcon.
2. Understand the preparation, handling, and function of reagents used during the Microcon procedure.
3. Be able to properly calculate DNA concentrations of a Microcon.
4. Be able to properly aliquot samples for Amplification.
5. Understand the use of controls introduced at this stage of DNA typing.
6. Be able to explain the theory and procedures to someone who does not have a scientific background.

Final actions

1. Discuss the module with your direct supervisor or designee, including review of results and discussion of theory and practical aspects of module.
2. Have your supervisor or designee evaluate the results of the competency test.
3. Have your supervisor or designee document successful completion of the module. *The initials/signature of the supervisor or designee indicates that all practical exercises have been completed and the correct results have been obtained on the competency test (if applicable).*

MODULE 8: PCR AMPLIFICATION		
DATE EFFECTIVE 04/15/16	APPROVED BY DNA TECHNICAL LEADERS	PAGE 1 OF 2

Required lectures

PCR theory*
STR typing*

*Interpreting Analysts Only

Required reading

1. Study the articles in the online reference folder on this topic.
2. Study the amplification methods in the Protocols for Forensic STR Analysis the Manual.

Practical exercises

When you run analytical procedures during training or receive samples for competency testing, document and create records as if you were working on a real case.

After observing the procedure and having demonstrated the procedure to the trainer, do the following experiments.

PCR amplification

1. Aliquot correct amounts of DNA and amplify all practice samples using the current autosomal PCR system used in casework.
2. Aliquot correct amounts of DNA and amplify all practice samples for Y STR analysis.

Review the results with a supervisor or designee; once correct PCR typing results are obtained on the practice samples, perform PCR amplification and typing on the competency test samples in the appropriate PCR systems.

Submit the PCR typing results for review to your supervisor. If a supervisor or designee feels that additional work is necessary, it should be completed before continuing. Once all work is completed and passed, continue to the analytical training (if applicable).

Competency test

The competency test samples provided for Extraction are used for all subsequent DNA competency tests. The training group may also provide extracts with known quantification values as competency test samples in lieu of competency test samples provided for extraction.

The DNA typing results for positive controls and practice and competency samples must be correct. Amplification, Microcon and extraction negatives must give clean results. Samples must yield complete or source attribution profiles.

Those already deemed competent in PCR amplification on other PCR kits, such as Identifiler and/or MiniFiler, will need to observe one demonstration, perform one observed practice and a competency test in the new PCR system. The training group will provide extracts with known quantification values as competency test samples.

KSA's to be mastered

1. Be able to correctly interpret Quantitation results, make any necessary calculations, and submit proper amounts for amplification.
2. Understand the preparation, handling, and function of reagents used for PCR amplification and DNA typing.
3. Understand the use of controls introduced at this stage of DNA typing.
4. Be able to amplify samples in all DNA systems used in casework.
5. Understand the theory of PCR.
6. Be able to explain the theory and procedure to someone who does not have a scientific background.

Final actions

1. Discuss the module with a supervisor or designee, including review of results and discussion of theory and practical aspects of module.
2. Have a supervisor or designee evaluate the results of the competency test.
3. Have a supervisor or designee document successful completion of the module. *The initials/signature of a supervisor or designee indicates that all practical exercises have been completed and the correct results have been obtained on the competency test (if applicable).*

MODULE 9A: ABI 3130*xl* CAPILLARY ELEXTROPHORESIS SET UP		
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Required lectures

PCR theory*
STR typing*
Basics of capillary electrophoresis on the ABI 3130*xl**

*Interpreting Analysts Only

Required reading

1. Study the articles in the online reference folder on this topic.
2. Study the capillary-based DNA methods in the Protocols for Forensic STR Analysis Manual.

Practical exercises

When you run analytical procedures during training or receive samples for competency testing, document and create records as if you were working on a real case.

After observing the procedure and having demonstrated the procedure to the trainer, do the following experiments.

1. Set up the ABI 3130*xl* instrument including buffer, POP and water changes.
2. Create a sample/batch sheet for the current 3130*xl* capillary-based PCR system (Autosomal and Y STR) and aliquot correct amounts of amplified practice samples and master mix onto 3130*xl* plate.
3. Load the plate onto instrument.

Review the results with a supervisor or designee; once correct PCR typing results are obtained on the practice samples, perform set up and typing on the competency samples in all 3130*xl* capillary-based casework PCR systems.

Submit the PCR typing results for review to a supervisor or designee. If a supervisor or designee feels that additional work is necessary, it should be completed before continuing. Once all work is completed, continue to analytical training (if applicable).

Criminalist I's can/will have the 3130xl sample/batch sheet created for them and must aliquot samples for PCR analysis so that the typing results can be evaluated by a supervisor or designee.

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Criminalist II's and above will create their own sample/batch sheet and perform their own PCR analysis.

Competency test

The competency test samples provided for extraction are used for all subsequent DNA competency tests.

The DNA typing results must be correct. Extraction and amplification negatives must give clean results. Each sample result must either give the correct full DNA profile or achieve source attribution in the PCR system(s) tested.

KSA's to be mastered

1. Understand the preparation, handling, and function of reagents used for PCR amplification and DNA typing.
2. Understand the use of controls introduced at this stage of DNA typing.
3. Be able to amplify and type samples in all DNA systems used in casework.
4. Understand the theory of PCR, the basics of STR typing, and the basics of capillary electrophoresis.
5. Be able to explain the theory and procedure to someone who does not have a scientific background.

Final actions

1. Discuss the module with a supervisor or designee, including review of results and discussion of theory and practical aspects of module. This may necessitate the direct supervisor observing the trainee demonstrate proper archiving of data.
2. Have your a supervisor or designee evaluate the results of the competency test.
3. Have your a supervisor or designee document successful completion of the module. *The initials/signature of a supervisor or designee indicates that all practical exercises have been completed and the correct results have been obtained on the competency test (if applicable).*

MODULE 9B: AUTOSOMAL AND Y-STR ANALYSIS		
DATE EFFECTIVE 04/15/16	APPROVED BY DNA TECHNICAL LEADERS	PAGE 1 OF 3

Required lectures

PCR theory
STR typing
Basics of capillary electrophoresis on the ABI 3130*xl*

Required reading

1. Study the articles in the online reference folder on this topic.
2. Study the capillary-based DNA methods in the Protocols for Forensic STR Analysis Manual.

Practical exercises

When you run analytical procedures during training or receive samples for competency testing, document and create records as if you were working on a real case.

After observing the procedure and having demonstrated the procedure to the trainer, do the following experiments.

1. Analyze the data for all practice samples* using current 3130*xl* capillary-based PCR system (Autosomal and Y STR).
2. Edit all practice samples using current accepted guidelines.

Review the results with a supervisor or designee; once correct PCR typing and editing results are obtained on the practice samples, analyze and edit the competency test samples in all 3130*xl* capillary-based casework PCR systems.

Submit the PCR typing results for review to your supervisor. If a supervisor or designee feels that additional work is necessary, it should be completed before continuing. Once all work is completed and passed, continue to the last part of analytical training.

* Those already deemed competent in Extraction, PCR amplification and ABI 3130*xl* Capillary Electrophoresis Set Up will be provided with STR runs for analysis training. The runs can be found in:
M:\FBIOLOGY_MAIN\TRAINING\Interpretations Reviews and Exercises\STR Analysis

Competency test

The competency test samples provided for extraction* are used for all subsequent DNA competency tests.

The DNA typing results must be correct. Extraction and amplification negatives must give clean results. Samples must yield complete profiles. All alleles assigned including the allelic ladder, positive control, and samples must be correct. All artifact peaks must be properly edited and the reasons for the edits must be accurately identified.

* Those already deemed competent in Extraction, PCR amplification and ABI 3130*xl* Capillary Electrophoresis Set Up will be provided with STR runs for analysis training. The runs can be found in:
M:\FBIOLOGY_MAIN\TRAINING\Interpretations Reviews and Exercises\STR Analysis

Those already deemed competent in PCR amplification and ABI 3130*xl* Capillary Electrophoresis on other PCR kits, such as Minifiler, will need to observe one demonstration, perform one observed practice and one competency analysis in the new PCR system. The training group will provide analysis sets for practice and competency.

KSA's to be mastered

1. Understand the preparation, handling, and function of reagents used for PCR amplification and DNA typing.
2. Understand the use of controls introduced at this stage of DNA typing.
3. Be able to amplify and type samples in all DNA systems used in casework.
4. Be able to correctly edit electropherograms, including the correct identification of artifacts.
5. Be able to properly use the instrument and associated computers, and archive data correctly.
6. Understand the theory of PCR, the basics of STR typing, and the basics of capillary electrophoresis.
7. Be able to explain the theory and procedure to someone who does not have a scientific background.

Final actions

1. Discuss the module with a supervisor or designee, including review of results and discussion of theory and practical aspects of module. This may necessitate the direct supervisor observing the trainee demonstrate proper archiving of data.

2. Have a supervisor or designee evaluate the results of the competency test.
3. Have a supervisor or designee document successful completion of the module. *The initials/signature of a supervisor or designee indicates that all practical exercises have been completed and the correct results have been obtained on the competency test (if applicable).*

MODULE 16: MITOCHONDRIAL DNA ROCHE AND HOMEBREW DUPLEX AMPLIFICATION

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07-16-2012	DNA TECHNICAL LEADERS	1 OF 2

Required lectures
mtDNA lecture

Required reading
1. Study articles on this topic.
2. Study the amplification methods in the Protocols for Forensic Mitochondrial DNA Analysis Manual.

Practical exercises
The practice samples provided for extraction may be used for all subsequent mtDNA practice exercises.

When you run analytical procedures during training or receive samples for competency testing, document and create records as if you were working on a real case.

After observing the procedure, perform the following methods, using appropriate samples: (generally, hair extracts for Roche and buccal extracts for Homebrew). Practical exercises can be performed using one system only, or both systems.

1. mtDNA Roche duplex amplification
2. mtDNA Homebrew duplex amplification

Create correct documents and records, aliquot correct amounts of DNA and amplify all practice samples along with an amplification negative control and the HL60 positive control. Create an Agilent batch sheet.

Competency test
The competency test samples provided for extraction may be used for all subsequent mtDNA competency tests.

Each competency sample and extraction negative must be amplified along with a positive control and amplification negative.

Competency can be performed using one amplification system only, or both systems.

MODULE 16: MITOCHONDRIAL DNA ROCHE AND HOMEBREW DUPLEX AMPLIFICATION		
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KSA's to be mastered

1. Be able to correctly interpret DNA quantitation results, make any necessary calculations, and submit proper amounts for amplification in Roche and/or Homebrew amplifications.
2. Understand the preparation, handling, and function of reagents used for duplex amplification and mtDNA typing.
3. Understand the use of controls introduced at this stage of DNA typing.
4. Understand how the Roche and Homebrew duplex amplifications work.
5. Be able to explain the theory to someone who does not have a scientific background.

Final actions

1. Discuss the module with your direct supervisor, including review of results and discussion of theory and practical aspects of module.
2. Have your supervisor evaluate the results of the competency test.
3. Have your supervisor document successful completion of the module. *The initials/signature of the supervisor indicates that all practical exercises have been completed and the correct results have been obtained on the competency test (if applicable).*

APPENDIX		
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Suggested Tracking Sheets

Forensic Biology Training Lecture Tracking Sheet

Forensic Biology Training Practice Tracking Sheet

Forensic Biology Competency Tracking Sheet

Forensic Biology Mitochondrial DNA Training Tracking Sheet

Forensic Biology Training Review Tracking Sheets

DNA Moot Court Evaluation Form – Judge

DNA Moot Court Evaluation Form – Juror

Written Examination