San Diego Police Department

Training Program Manual

Forensic Biology

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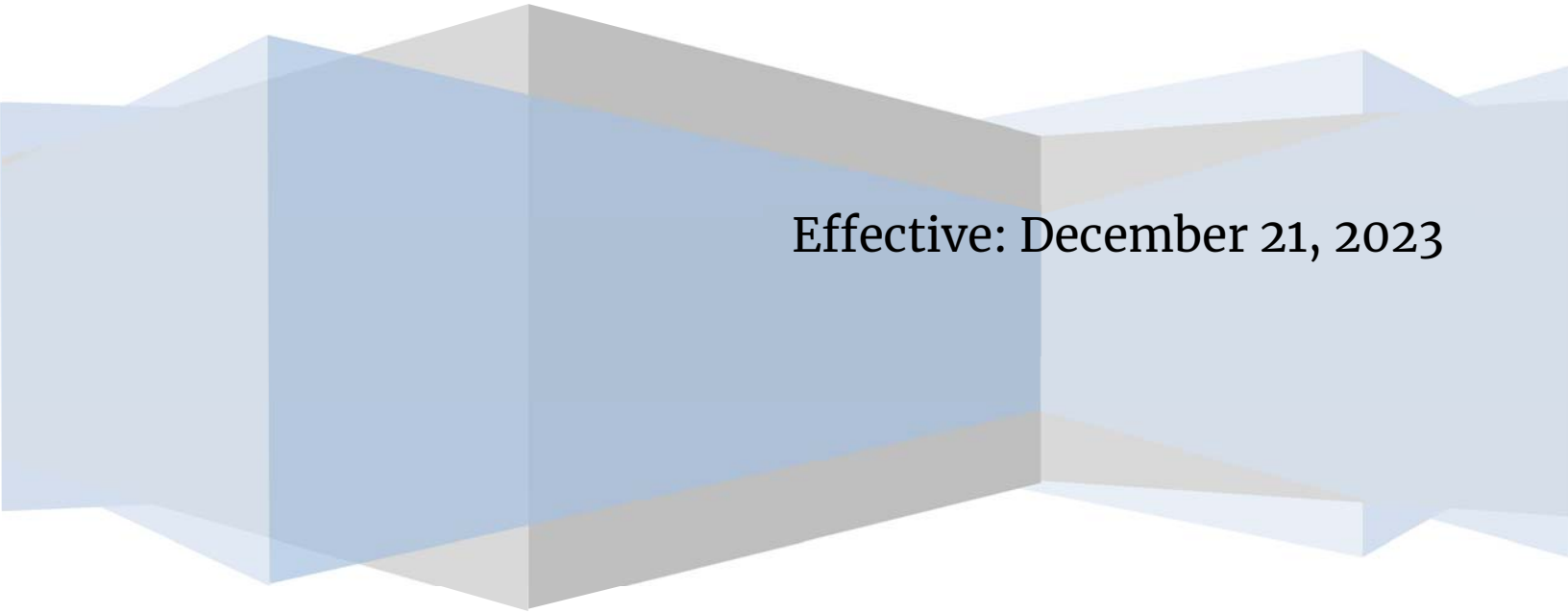

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GENERAL

The San Diego Police Department Forensic Biology Training Program is based on training Guidelines published by the Scientific Working Group on DNA Analysis Methods (SWGDAM July 7, 2020). The training program is intended to supplement coursework in the fields of biochemistry, genetics, statistics, and molecular biology and to further the understanding of the trainee in the underlying scientific principles of forensic biology and DNA testing. To successfully complete the training program, trainees are expected to have a solid understanding of the following foundational topics:

Basic principles of Biochemistry
Basic principles of Molecular Biology
Basic principles of Genetics
Basic principles of Statistics
Basic principles of Population Genetics
The basic components and structure of DNA
The roles of genes and chromosomes
Mitosis and meiosis
Homozygosity and heterozygosity
Differences between DNA and RNA
The basic structures of the nucleotide bases
DNA polymerases types and functions
PCR theory
Standard PCR reaction components and function
Factors affecting PCR specificity
Properties of Taq DNA Polymerase

The Training Program Manual contains the training program overview and the various training modules required to be considered qualified to perform analyses. The modules cover both conventional serology and DNA analyses.

Training assignments will be performed in accordance with the Crime Laboratory's Quality Manual and the Forensic Biology Unit's Policy and DNA Technical Manuals. Trainees will not perform any analyses related to casework until they have completed all training requirements and been approved and authorized to perform such testing.

COORDINATION OF THE TRAINING PROGRAM

The DNA Technical Manager has responsibilities under The FBI Director's *Quality Assurance Standards Audit for Forensic DNA Testing Laboratories* (QAS) for the oversight of DNA training program and the approval and documentation of analyst qualifications prior to independent casework. At the San Diego Police Department, this oversight also includes training in serological methods. The DNA Technical Manager may delegate certain duties and/or sections of training to other qualified examiners, but is ultimately responsible for the overall training assignment of the individual(s) within the laboratory.

STRUCTURE OF THE TRAINING PROGRAM

The training program consists of modules that can be completed individually or in combination. Completion of any analytical, interpretational, and/or statistical module requires passing a competency test including a practical component and written and/or oral components prior to independent testing of evidence samples. Completion of any analytical, interpretational, and/or statistical module for laboratory support (testing of non-evidentiary samples) requires a competency including a practical component. The competency test for multiple modules can be combined, for example multiple modules in the DNA series can be completed with a comprehensive practical and written examination. Trainees may receive training and become competent in a subset of the modules in the training program based upon job function (i.e. only become qualified for the extraction and quantitation of cartridge case evidence). Trainees only need to complete each module once. The main areas of the program are:

Forensic Biology Quality Assurance (Module 1)
Evidence Handling and Sampling (Modules 2-3)
Serology (Modules 4-7)
DNA – Extraction and Quantitation (Modules 8-10)
DNA – PCR Amplification of Autosomal STRs (Modules 11-12)
DNA – Capillary Electrophoresis (Modules 13-14)
DNA – Interpretation (Modules 15-30)
Report Writing (Module 31-32)
Courtroom Presentation of Forensic Biology Evidence (Module 33)
Y-STR Analysis (Module 34)
Interpretation of Legacy Kit Data (Module 35)
CODIS Administration (Module 36)

PRIOR TRAINING OR EXPERIENCE

Analysts who have previous forensic experience may submit documentation of their prior training for evaluation by the DNA Technical Manager. If documentation of the analyst's prior training in specific areas is provided and approved, the analyst's training program may be adapted to reflect the prior training. Analysts that are approved for amended training programs will still be required to pass applicable competency tests prior to their approval and authorization for independent casework. Approval for an adapted training program will be documented by the DNA Technical Manager and submitted to the Quality Manager with the completed training record.

TRAINING OF LABORATORY TECHNICIANS, INTERNS, OR VOLUNTEERS

Laboratory Technicians, interns, or volunteers will not perform any analyses related to casework (e.g., validations or quality control testing) until they have completed all training requirements determined by the DNA Technical Manager, completed a practical competency, and been approved and authorized to perform such testing.

The training program presented herein may be adapted to reflect a narrower scope required to approve and authorize a laboratory technician, intern, or volunteer to perform testing. Approval for an adapted training program will be documented by the DNA Technical Manager and submitted to the Quality Manager with the completed training record.

Laboratory Technicians, interns, and volunteers conduct various job-related tasks, such as cleaning, maintaining, and organizing the laboratory, which are not directly related to casework. Training for these tasks will consist of the trainee observing a previously trained analyst, laboratory technician, intern, or volunteer performing the task and then having a previously qualified individual observing the trainee successfully complete the task. Upon successfully completing the observed task, the Laboratory Technician, intern, or volunteer will be qualified to perform the task unsupervised. This training will be documented on training check lists at the end of this document.

ANALYST SHADOWING

Analyst shadowing will be accomplished on a module-by-module basis. For instance, the first required analyst shadowing occurs in module 2, which should include viewing of analysts using the EvidenceOnQ software to request evidence from the Property Room, retrieval of evidence from the Property Room, the documentation of the evidence in the FB SIMS, as well as any sampling. Subsequent module shadowing requirements will include the elements specific to those modules.

RESPONSIBILITIES OF THE TRAINEE

The trainee will be expected to follow all policies and requirements contained within the Quality Assurance, Safety, Unit Policy, and Technical manuals. By signing off in PowerDMS on the manuals, the trainee is acknowledging reading and understanding of the contents of the manuals and agreeing to abide by the provision within them. If the trainee has any questions regarding the manuals, those should be clarified prior to performing any training procedures. Despite having signed off on the Forensic Biology Technical Manual in PowerDMS, trainees will be required to review selected parts of this manual throughout the training program to reinforce the learning objectives throughout this manual.

No deviations from any procedure outlined in any manual will be accepted without prior approval from the DNA Technical Manager.

The trainee will address any questions which may arise to the trainee's assigned trainer or the DNA Technical Manager. Any issues must be resolved prior to independent procedural action taken by the trainee.

The trainee will keep a hardcopy or electronic record summarizing all work and completed activities related to training received within the Forensic Biology Unit.

The record must be concise, compiled contemporaneously, accurately depict training activities, and be readily available for review throughout the training.

The trainee must submit the training record for review at the completion of the training program prior to approval and authorization for independent casework.

The trainee will shadow an experienced analyst throughout the entire duration of the process they are observing.

Where applicable, the trainee will complete a summary of the required readings. The summary will be a brief paragraph that highlights the main points of the required readings. While all items within the reading lists of each module are required, some are in the list for foundational, while others in the list will be used as reference material extensively in casework and court preparation.

RESPONSIBILITIES OF THE TRAINERS

Although specific individuals may be assigned training duties, all qualified analysts in the forensic biology unit will be available to assist trainees during their participation in the training program.

Trainers will behave with professionalism and always treat trainees with respect.

Trainers will be expected to provide meaningful and detailed instruction to the trainees.

Trainers will bring any issues discovered within the training to the attention of the DNA Technical Manager.

Trainers will be expected to have trainees observe the totality of any process assigned. As an example, if an analyst is having a trainee shadow the quantification step of analysis, it is expected that the analyst will have the trainee shadow every aspect of the analysis. This includes obtaining the reagents from the refrigerator and freezer, worksheet preparation, preparing the samples and required dilutions, sample setup (manual or robotic), data transfers, and data interpretation.

Trainers will provide the trainees with a comprehensive overview of any process being observed including providing guidance on documentation of the process, instruction on instrumentation, quality control, quality assurance, and interpretation of results.

SPECIALIZED MODULES

Y-Chromosome STR testing and legacy kit interpretation represents specialized testing that is not contained within the standard training program. Not every analyst will complete the training to perform these tasks. Trainees must successfully complete the training modules associated with a specialized module prior to being approved and authorized for that testing.

NEW MODULES

Current analysts undergo training and competency testing in all new methods. Training modules for newly validated methods are generally created prior to implementation, and will be added to the training program manual for new analysts as soon as practical.

CASE PACKET REVIEWS

Case packet reviews will be guided interactive training exercises where trainees and trainers step through the testing, interpretation, and documentation of case analyses. The review will focus on case approach, testing performed, searching of CODIS databases, and reporting of the results. The goal of case packet reviews is to provide trainees with an overview of a broad scope of case analyses performed by qualified analysts within the unit.

EVALUATION OF TRAINEES

The trainee will be tested on their knowledge of the theory underlying each methodology through written, oral, and/or practical examinations.

Satisfactory performance in the training program and authorization is required prior to a trainee being permitted to perform any laboratory function or analysis associated with biology casework.

Trainees are evaluated by their performance on the training assignments, quizzes, adjudicated or mock casework, as well as the results of the written and/or practical competency test(s). Trainers and/or the DNA Technical Manager will provide periodic written feedback to the trainees.

Successful completion of an oral board or moot court will be required for completion of the training program, or after a defined set of modules, but may occur subsequent to the commencement of independent casework.

QUIZZES AND WRITTEN TESTS

Feedback and corrections will be provided for all module quizzes. Passing for all written tests/examinations is 80%. The DNA Technical Manager, or designee, will be responsible for grading all tests. A scoring rubric will guide the grading of all written tests/examinations.

MOOT COURT OR ORAL BOARDS

A panel of evaluators designated by the DNA Technical Manager will evaluate the trainee's moot court or oral board. Moot courts will be evaluated using the laboratory testimony evaluation form and all members of the panel must give the trainee a passing grade for the trainee to pass the moot court. The testimony evaluation forms will be reviewed with the trainees to provide them with constructive feedback. Passing for oral boards is 80% based upon a scoring rubric designated by the DNA Technical Manager. The final grade for the oral boards will be determined based on the average of the panel of evaluators.

TARGETED TRAINING

In the event that additional instruction on one or more topics is required, trainees or analysts will be provided targeted training. Targeted training is supplemental instruction, which may be in the form of additional required reading, lectures, practice sets, or research assignment as determined by the DNA Technical Manager. Trainees undergoing targeted training may be required to pass some form of evaluation (i.e., written or oral examination) before moving on to subsequent modules within the training program.

TRAINING PROGRAM MODULES

MODULE 1: FORENSIC BIOLOGY QUALITY ASSURANCE

Learning objectives:

Quality assurance and quality control within the forensic biology unit.
Quality control of critical reagents and kits
Bias
Instrument calibrations and verifications
Clean technique.

Policies and procedures regarding clean technique
Use of personal protective equipment
Decontamination of general laboratory and individual work areas
Cleaning and sterilization procedures for laboratory equipment
Sample handling practices

Reading List

1. Quality Assurance Standards for Forensic DNA Testing Laboratory, FBI, July 2020
2. The Guidance Document for the FBI Quality Assurance Standards (QAS), July 2020
3. DNA Technology in Forensic Science (NRC I), Chapters 4 and 7, National Academy Press, 1992.
4. The Evaluation of Forensic DNA Evidence (NRC II), Chapter 3, National Academy Press, 1996.
5. ANAB Guiding Principles
6. CAC Code of Ethics
7. Code of Professional Responsibility for the Practice of Forensic Science, Department of Justice, 2016
8. J. Butler. Advanced Topics in Forensic DNA Typing: Methodology. Chapter 7. Academic Press. 2011.
9. Forensic Biology Policy Manual (latest version)

Requirements to complete module:

Training including Criminal and Civil Law (should be a part of new employee orientation)
Summary of readings
Review of "Kit QC" folder in the QA-QC Files folder on Forensic Biology network
Review of the Equipment and Quality Assurance section of the FB Unit Policy Manual
Pipetting and Dilution Exercise
Forensic Biology Quality Assurance examination (PowerDMS)

MODULE 2: EVIDENCE HANDLING

Learning objectives:
Firearms safety
Chain of Custody
EvidenceOnQ/SARTOnQ/LabOnQ
Forensic Biology Unit case acceptance policy
Chain of Custody: Intra- and Inter-laboratory transfer of evidence
Proper packaging and seals
Evidence storage procedures

Reading List:
1. CA-DOJ Firearms Safety Certificate Guide January 2019, Chapters 1 and 3.
2. EvidenceOnQ Training Documents

Requirements to complete module:
Summary of Readings
Analyst shadowing – chain of custody transfers
Property Room tour
Quiz

MODULE 3: EVIDENCE SAMPLING

Learning objectives:
FB SIMS
Expectations for notetaking with Forensic Biology
Photography of evidentiary items or diagramming of evidence items (when applicable)
Trace evidence collection techniques
Biological Evidence Collection Techniques
Handling evidence, sample collection, and derivative evidence items
Factors affecting deterioration of evidence
Consumption and conservation of evidence
Distinction between evidence and work product

Reading List:

1. FB SIMS Training PowerPoint
2. Trace Evidence Recovery Guidelines, Scientific Working Group on Materials Analysis (SWGMAT) Evidence Committee, January 1998 Revision, Forensic Science Communications, October 1999.
3. Hedman J, et al. The double-swab technique versus single swabs for human DNA recovery from various surfaces. Forensic Science International: Genetics 46 (2020) 102253
4. J. Butler. Advanced Topics in Forensic DNA Typing: Methodology. Chapter 1. Academic Press. 2011.
5. Saferstein. *Forensic Science Handbook, Volume I*, Chapter 5, Prentice Hall Publishing, 1982.
6. SWGDAM Contamination Prevention and Detection Guidelines for Forensic DNA Laboratories, 2017

Requirements to complete module:

Summary of Readings
Answers to possible court question on evidence sampling
FB SIMS notetaking
Training on laboratory expectations for derivative evidence
Analyst shadowing – sampling of evidence
Sampling of mock type evidence
Quiz

MODULE 4: SEROLOGY – BLOOD

Learning objectives:

Foundational information for presumptive and confirmatory serological tests for blood
- *Blood composition, function, and presumptive test chemistry*
- *Blood identification and collection methods*
- *Immunology and immunological testing for species origin*
- *ABAcard HemaTrace*
- *Bloodstain Pattern Interpretation*

QA procedures for blood testing
Basic bloodstain pattern recognition for screening evidence
Case approach in blood screening

Reading List:

1. Richard Li. Forensic Biology. CRC Press 2008 Chapters 4-7 (or 2nd ed. 2015 Chapters 10, 12, and 13).
2. Bevel and Gardner. Bloodstain Pattern Analysis 3rd Edition CRC Press 2008 Chapters 2, 10, 11, and 13
3. GW Owen and KW Smalldon. Blood and semen stains on outer clothing and shoes not related to crime: report on a survey using presumptive tests, J. Forensic Sci., 20(2):391-403, 1975.
4. ABAcard HemaTrace package insert.
5. S Tobe et al. Evaluation of Six Presumptive Tests for Blood, Their Specificity, Sensitivity, and Effect on High Molecular-Weight DNA, J. Forensic Sci, 52(1): 102-109, 2007

Requirements to complete module:

Summary of readings
Review relevant sections of the Forensic Biology Technical Manual (latest version)
Answers to possible court question on blood testing and bloodstain pattern identification
Shadowing of analyst blood testing
Presumptive test sensitivity and specificity studies including summary of findings
Suggested tests: Sensitivity (neat through 1/10,000 dilutions) dried bloodstains on fabric (not including luminol) using both swabbing and cutting methods of collection.
Specificity of the presumptive blood tests (not including luminol).
Confirmatory test sensitivity and specificity studies including summary of findings
Suggested tests: Evaluate the sensitivity and specificity of the ABAcard HemaTrace® test by analyzing the dilution series from above as well as various animal sera and human body fluids other than blood.
Blood testing and bloodstain pattern analysis documentation/screening exercise.
Review case file(s) with blood screening
Quiz

MODULE 5: SEROLOGY – SEMEN

Learning objectives:

Foundational information for presumptive and confirmatory serological tests for semen
Male reproductive system
Composition and function of semen and its components
Alternate light source – theory and application
Presumptive testing - theory and application
Semen stain identification and collection methods
Sperm cell morphology and microscopy staining techniques
Bright field versus phase contrast microscopy
Introduction to p30

Azospermia, oligospermia, and vasectomized males
ABAcard p30 card

QA procedures for seminal fluid/semen testing

Reading List:

1. Richard Li. Forensic Biology. CRC Press 2008 Chapter 8 (or 2nd ed. 2015 Chapter 14).
2. ABAcard p30 test product insert.
3. Noel, S, et al. DNA transfer during laundering may yield complete genetic profiles. Forensic Science International: Genetics 23 (2016) 240–247
4. Noel, S, et al. Repeatedly washed semen stains - Optimal screening and sampling strategies for DNA analysis. Forensic Science International: Genetics 38 (2019) 9–14
5. Casey DG, et al. The Persistence of Sperm and the Development of Time Since Intercourse (TSI) Guidelines in Sexual Assault Cases at Forensic Science Ireland, J. Forensic Sci., 62:585-592, 2017
6. Crime-Lite Auto manual
7. Crime-Lite Auto validation

Requirements to complete module:

Summary of readings
Review relevant sections of the Forensic Biology Technical Manual (latest version)
Answers to possible court question on semen testing
Shadowing of analyst semen testing
ALS sensitivity and specificity studies including summary of findings
Suggested tests: visual and ALS examination of a dilution series (neat through 1/80 dilutions) of dried semen on fabric as well as dried mixtures of semen with different biological fluids on fabric. Examination of stains on various fabrics (patterned, fluorescent, dark vs. light, etc)
Presumptive test sensitivity and specificity studies including summary of findings
Suggested tests: presumptive testing on a dilution series (neat through 1/80 dilutions) of dried semen on fabric as well as dried mixtures of semen with different biological fluids on fabric. Sample using both swabbing and cutting methods. Conduct AP mapping exercise on at least one stain on fabric.
Confirmatory test sensitivity and specificity studies including summary of findings
Suggested tests: use the sample sets created for presumptive testing for confirmatory testing methods. Evaluate the specificity ABA card p30 test by examining the results for different body fluids. Examine slides or images of stained sperm cells from different species.
Review case file(s) with semen screening
Semen analysis documentation/screening exercise.
Quiz

Module 6: Serology – Analysis of Saliva and Other Biologicals

Learning objectives:
Physiology, function, components, and identification of saliva, feces, and urine

Reading List:
1. Richard Li. Forensic Biology. CRC Press 2008 Chapter 9. (or 2nd ed. 2015 Chapters 15 and 17).
2. M. Auvdel. Amylase levels in semen and saliva stains, J. Forensic Sci., 31:426-430, 1986.
3. Phadebas product insert
4. Phadebas internal validation summary

Requirements to complete module:
Summary of readings
Review relevant sections of the Forensic Biology Technical Manual (latest version)
Answers to possible court question on saliva and other biological testing
Phadebas presumptive test for saliva including a summary of the results

Suggested tests: Evaluate the variability of amylase levels in saliva from different people and from the same individual from various times during a 24 hour period. Evaluate the specificity of the method using other body fluids and secretions. Evaluate the sensitivity of the method using liquid and dried saliva. Evaluate the stability of amylase by performing the test on saved standards as well as on older dried saliva stains and evidence type samples (e.g. cigarette butts and envelopes).

Quiz

Module 7: Serology – Interpretation Guidelines

Learning objectives:
Differentiation between serology test results, conclusions, and inferences
Evaluation of various combinations of serology tests

Requirements to complete module:
Review of applicable sections of technical manual covering serological tests and interpretations guidelines
Quiz

In order for an analyst to be qualified to perform serology on evidence without proceeding to DNA modules, a written examination covering serology, mock/adjudicated cases in the relevant serology procedures, a practical examination in serology, and a moot court/oral board are required (see Assessment of Trainees section). Training in writing discontinued cases is also recommended.

MODULE 8: HISTORICAL PERSPECTIVE OF FORENSIC DNA ANALYSIS

Learning objectives:
History of DNA identification
Mitochondrial DNA
YSTRs

Reading List:
1. J. Butler. Fundamentals of Forensic DNA Typing. Chapters 1, 3, and 16. Academic Press. 2010.
2. The Evaluation of Forensic DNA Evidence (NRC II), Chapters 1-2, National Academy Press, 1996.

Requirements to complete module:
Summary of readings
Quiz

MODULE 9: DNA EXTRACTION AND PURIFICATION

Learning objectives:

Composition of DNA within cells
DNA stability
DNA extraction and differential extraction methods including QIAcube and non-differential extraction with DTT
DNA concentration procedures
Commonly used methods of DNA purification and DNA extraction efficiency
Contamination considerations and quality control in the DNA isolation and purification process

Reading List:

1. J. Butler. Advanced Topics in Forensic DNA Typing: Methodology. Chapter 2. Academic Press. 2011.
2. Montpetit SA, Fitch IT, O'Donnell PT. A simple automated instrument for DNA extraction in forensic casework, J Forensic Sci. 2005 May;50(3):555-63.
3. BioRobot EZ1 User's Manual.
4. BioRobot EZ1 XL Advanced User's Manual.
5. Kishore R *et al.* Optimization of DNA extraction from low-yield and degraded samples using the BioRobot EZ1 and BioRobot M48, J Forensic Sci 51(5), pp. 1055-1061, 2006.
6. Wiegand P, Schurenkamp M. and Schutte U. DNA extraction from mixtures of body fluid using mild preferential lysis, Int J Leg med (1992) 104: 359-360.
7. Schwerdtner G *et al.*, The separation of male and female: A comparison of seven protocols (P), Forensic Science International: Genetics Supplement Series 6 (2017) e9-e11.
8. SDPD QIAcube Validation Summary.
9. QIAcube User's Manual.
10. Montpetit S and O'Donnell P. An optimized procedure for obtaining DNA from fired and unfired ammunition. Forensic Science International: Genetics 17 (2015) 70–74

Requirements to complete module:
Summary of readings
Review relevant sections of the Forensic Biology Technical Manual (latest version)
Answers to possible court question on testing for extraction and purification
Analyst shadowing (focus on EZ1 purification)
Reagent Blank Quiz
General DNA Extraction of (4 known single source samples)
DNA Extraction from Reference Samples (4 known reference samples)
Quiz

MODULE 10: DNA QUANTIFICATION

Learning objectives:
Methods of DNA quantification
Principles of quantitative PCR DNA quantification including detection of PCR inhibition
Interpretation of quantification results including ratio between human and male DNA targets
Discontinuation policy and YSTR testing thresholds
Instrumentation and troubleshooting

Reading List:

1. J. Butler. Advanced Topics in Forensic DNA Typing: Methodology. Chapter 3. Academic Press. 2011.
2. Horsman, KM et al. Development of a human specific real time PCR assay for the simultaneous quantitation of total genomic and male DNA. Journal of Forensic Sciences 51 (2006), 758-765
3. Grgicak, CM, et al. Investigation of reproducibility and error associated with qPCR methods using Quantifiler Duo quantification kit. Journal of Forensic Sciences 55 (2010), 1331-1339
4. Holt, A, et al. Developmental validation of the Quantifiler® HP and Trio Kits for human DNA quantitation in forensic samples
5. SDPD QuantStudio 5 Quantifiler Trio Validation Summary
6. SDPD Validation Teachback – Quantification
7. Quantifiler Trio and QS 5 Overview
8. QS5 Maintenance and Overview SDPD
9. HPS Quant Tips & Tricks
10. QuantStudio 5 User Guide
11. Quantifiler Trio DNA Quantification Kit User Guide

Requirements to complete module:
Summary of readings
Review relevant sections of the Forensic Biology Technical Manual (latest version)
Answers to court question on testing for DNA quantification
Analyst shadowing (manual and Nimbus)
Quantitation exercise
Quantitation of samples extracted in module 9 (manual and Nimbus)
Quiz

In order for an analyst to be qualified to perform DNA extraction and/or quantitation on one or more types of evidence without proceeding to additional DNA modules, the analyst must successfully complete the extraction and quantitation portions of the exercises for the relevant evidence types (see Modules 16-20 and 22-25), a written examination covering the relevant areas of extraction and quantitation, mock/adjudicated DNA cases in the relevant extraction and quantitation procedures, a practical examination, and a moot court/oral board (see Assessment of Trainees section).

MODULE 11: PCR AMPLIFICATION OF DNA

Learning objectives:
PCR amplification (and inhibition)
Fluorescent tagging
Mobility modifiers
Multiplexing

Reading List:
1. J. Butler. Advanced Topics in Forensic DNA Typing: Methodology. Chapter 4. Academic Press. 2011.
2. Bloch W. A biochemical perspective of the polymerase chain reaction. Biochemistry 30 (1991), 2735-2747
3. Gill, P. et al. An investigation into the rigor of interpretation rules for STRs derived from less than 100pg of DNA. Forensic Science International 112 (2000), 17-40.
4. Wilson, IG. Inhibition and Facilitation of Nucleic Acid Amplification. Applied and Environmental Microbiology (1997), 3741-3751
5. Pionzio, A. et al. Analysis of the Effect of a Variety of PCR inhibitors on the amplification of DNA NCRJS 2018

Requirements to complete module:
Summary of readings
Review relevant sections of the Forensic Biology Technical Manual (latest version)
Answers to court question on testing for DNA amplification
Analyst shadowing (manual, Nimbus, and concentration/dilution)
Exercise on determining amplification volume
Amplification of samples extracted in module 9 (manual and Nimbus)
Quiz

MODULE 12: SHORT TANDEM REPEATS (STRS)

Learning objectives:
Short Tandem Repeats (STR's) – autosomal and Y-chromosome
STR testing artifacts
Allelic Variations (off-ladder alleles, tri-alleles, null-alleles, duplications/triplications)

Reading List:
1. J. Butler. Advanced Topics in Forensic DNA Typing: Methodology. Chapter 5. Academic Press. 2011.
2. Butler JM. Genetics and Genomics of Core Short Tandem Repeat Loci Used in Human Identity Testing. J Forensic Sci, 2006, Vol. 51, No. 2
3. Grossman, PD. High-density multiplex detection of nucleic acid sequences: oligonucleotide ligation assay and sequence coded separation. Nucleic Acids Research 22 (1994), 4527-4534.
4. Hares, D. Selection and implementation of expanded CODIS core loci in the United States. Forensic Science International: Genetics 17 (2015) 33–34
5. Ludeman MJ, et al. Developmental Validation of GlobalFiler PCR Amplification Kit, Int J Legal Med (2018) 132:1555-1573
6. SDPD Forensic Biology GlobalFiler validation summaries.
7. GlobalFiler User Manual. Life Technologies

Requirements to complete module:
Summary of readings
Answers to court question on testing for short tandem repeats
Quiz

MODULE 13: CAPILLARY ELECTROPHORESIS

Learning objectives:
DNA separation science
3500 Genetic Analyzer maintenance
Capillary electrophoresis
Resolution of alleles
Injection times
Laser induced fluorescence
Spectrals
Spatials
Instrumentation and troubleshooting

Reading List:
1. J. Butler. Advanced Topics in Forensic DNA Typing: Methodology. Chapter 6. Academic Press. 2011.
2. 3500 User Manual.

Requirements to complete module:
Summary of readings
Review relevant sections of the Forensic Biology Technical Manual (latest version)
Answers to court question on testing for capillary electrophoresis
Analyst shadowing (manual and QIAgility)
Capillary Electrophoresis of samples extracted in module 9 (manual and QIAgility)
Quiz

MODULE 14: DATA ANALYSIS

Learning objectives:
GMID-X
Allelic Ladders
Internal Size Standards
Analytical threshold
GMID-X Analysis Methods
GMID-X Panels and Bins

Reading List:

1. J. Butler. Fundamentals of Forensic DNA Typing. Chapters 10. Academic Press. 2010.
2. GeneMapper ID-X Analysis Software user guide.
3. SDPD GeneMapper ID-X Validation summary.

Requirements to complete module:

Summary of readings
Review relevant sections of the Forensic Biology Technical Manual (latest version)
Answers to court question on testing for data analysis
Analyst shadowing
Analytical Batch review
GMID-X Troubleshooting Exercise
Data analysis of samples extracted in module 9
Quiz

In order for an analyst to be qualified to perform PCR amplification, capillary electrophoresis, and data analysis on evidence without proceeding to additional DNA modules, the analyst must have previously been qualified to perform DNA extraction and quantitation of one or more evidence sample types. Additionally, the analyst must successfully complete the PCR amplification through data analysis portions of exercises for the relevant evidence types (see Modules 16-20 and 22-25), a written examination covering the relevant areas of PCR amplification through data analysis, PCR amplification through data analysis of mock/adjudicated DNA cases, a practical examination covering PCR amplification through data analysis, and a moot court/oral board (see Assessment of Trainees section).

MODULE 15: INTERPRETATION PART 1: SINGLE SOURCE SAMPLES

Learning objectives:

STR Interpretation
Stochastic thresholds
Artifacts (minus-A, stutter, pull-up, non-human DNA, spikes, other kit artifacts)
Expected stutter ratios
Dynamic Range of the 3500 instrument
Troubleshooting interpretation issues

Reading List:

1. J. Butler. Advanced Topics in Forensic DNA Typing: Methodology. Chapter 10-11. Academic Press. 2011.
2. J. Butler. Advanced Topics in Forensic DNA Typing: Interpretation. Chapter 1-5, and 8. Academic Press. 2015.
3. Bright, J-A, et al. Investigation into the performance of different models for predicting stutter. Forensic Science International: Genetics 7 (2013), 433-437
4. SWGDAM Interpretation Guidelines for Autosomal STR Typing by Forensic Testing Laboratories (2015).

Requirements to complete module:

Summary of readings
Review relevant sections of the Forensic Biology Technical Manual (latest version)
Answers to court question on testing for interpretation
Quiz

MODULE 16: BLOOD SAMPLE ANALYSIS

Learning objectives:

FB SIMS
Sample processing
Documenting analytical processes (analytical batches)
Data transfers between the FB SIMS and instruments

Requirements to complete module:

Analysis of fifteen single source bloodstains including stains from males and females
(If bloodstains were chosen for module 9, this number may be reduced)
Case packet review (focus on DNA analysis of single source samples)

MODULE 17: BUCCAL SAMPLE ANALYSIS

Learning objectives:

FB SIMS
Sample processing
Documenting analytical processes
Data transfers between the FB SIMS and instruments

Requirements to complete module:
Analysis of five buccal samples including buccal samples from males and females

Module 18: Hair Analysis

Learning objectives:
FB SIMS
Sample processing
Documenting analytical processes
Data transfers between the FB SIMS and instruments

Requirements to complete module:
Analysis of three hairs

Module 19: Cigarette Butt Analysis

Learning objectives:
FB SIMS
Sample processing
Documenting analytical processes
Data transfers between the FB SIMS and instruments

Requirements to complete module:
Analysis of five cigarette butts

Module 20: Bone Analysis (optional)

Learning objectives:
FB SIMS
Sample processing
Documenting analytical processes
Data transfers between the FB SIMS and instruments

Requirements to complete module:
Analysis of bone powder extraction

MODULE 21: INTERPRETATION PART 2: MIXTURES

Learning objectives:

Number of contributor estimations and assumptions

Reading List:

1. J. Butler. Advanced Topics in Forensic DNA Typing: Interpretation. Chapter 6-7. Academic Press. 2015.
2. Gill, P., et al. (2006). DNA commission of the International Society of Forensic Genetics: Recommendations on the interpretation of mixtures. *Forensic Science International, 160*, 90-101.
3. SWGDAM (2017). SWGDAM interpretation guidelines for autosomal STR typing by forensic DNA testing laboratories. Section 2.
4. Budowle, B., et al. (2009). Mixture interpretation: defining the relevant features for guidelines for the assessment of mixed DNA profiles in forensic casework. *Journal of Forensic Sciences, 54*, 810-821.
5. Coble, Michael & Bright, Jo-Anne & S Buckleton, John & Curran, James. (2015). Uncertainty in the number of contributors in the proposed new CODIS set. Forensic science international. Genetics. 19. 207-211. 10.1016/j.fsigen.2015.07.005.
6. Benschop, CC, et al. The effect of varying the number of contributors on likelihood ratios for complex mixtures. Forensic Science International: Genetics 19 (2015) 92–99
7. Bright, JA, et al. The effect of the uncertainty in the number of contributors to mixed DNA profiles on profile interpretation. Forensic Science International: Genetics 12 (2014) 208–214

Requirements to complete module:

Summary of readings
Review relevant sections of the Forensic Biology Technical Manual (latest version)
Answers to court question on testing for interpretation
Number of Contributors Assumption and Exercise
Quiz

MODULE 22: MIXED SAMPLE ANALYSIS

Learning objectives:

FB SIMS
Sample processing
Documenting analytical processes
Data transfers between the FB SIMS and instruments

Requirements to complete module:
Analysis of twelve mixed samples with a range of NOC and estimated mixture ratios (note: mixed samples can be made from purified single source DNA samples)

Module 23: Sexual Assault Evidence Extraction

Learning objectives:
FB SIMS
Sample processing
Documenting analytical processes
Data transfers between the FB SIMS and instruments

Requirements to complete module:
Analysis of ten stains prepared from semen mixed with another bodily fluid from a separate donor (vaginal secretions, blood, saliva, etc)

Analysis of five male/female mixed stains using non-differential DNA extraction of sexual assault evidence protocol (not required for Laboratory Technicians)

Module 24: Touch/Wearer Analysis

Learning objectives:
FB SIMS
Sample processing
Documenting analytical processes
Data transfers between the FB SIMS and instruments

Requirements to complete module:
Analysis of five habitual wearer or handler type samples (including at least one firearm)

Module 25: Cartridge Case Analysis

Learning objectives:
FB SIMS
Sample processing
Documenting analytical processes
Data transfers between the FB SIMS and instruments

Requirements to complete module:
Analysis of at least five cartridge cases
Cartridge case exercise

MODULE 26: POPULATION GENETICS

Learning objectives:
Population genetics
Population allele frequencies
Population substructure

Reading List:
1. J. Butler. Advanced Topics in Forensic DNA Typing: Interpretation. Chapters 9 and 10. Academic Press. 2015.
2. Steffen, C, et al. U.S. population data for 29 autosomal STR loci, Forensic Science International: Genetics 7 (2013) e82-83
3. Steffen, et al. Corrigendum to 'U.S. population data for 29 autosomal STR loci., Forensic Science International: Genetics 31 (2017) e36-40
4. Buckleton, J, et al. Population-specific F_{ST} values for forensic STR markers: A worldwide survey. Forensic Science International: Genetics 23 (2016) 91–100

Requirements to complete module:
Summary of readings
Answers to court question on testing for population genetics
Quiz

MODULE 27: STATISTICS IN FORENSIC DNA ANALYSIS

Learning objectives:
Review of basic statistics (mean, mode, distributions, variance)
Profile probability versus match probability
Random match probabilities
Combined probability of inclusion (CPI)
Combined probability of exclusion (CPE)
Likelihood Ratios
Population substructure corrections (theta, F_{ST})

Reading List:

1. J. Butler. Fundamentals of Forensic DNA Typing. Chapters 11. Academic Press. 2010.
2. J. Butler. Advanced Topics in Forensic DNA Typing: Interpretation. Chapter 11-12. Academic Press. 2015.
3. STRmix User's Manual (current version) Section 4.3, pages 202-206. ESR
4. The Evaluation of Forensic DNA Evidence, Chapters 4-5, NRC II, National Academy Press, 1996.
5. Balding, D and Nichols, RA. DNA profile match probability calculation: how to allow for population stratification, relatedness, database selection and single bands. Forensic Science International 64 (1994), 125-140.
    a. Balding D and Nichols, RA. Erratum: A method for quantifying differentiation between populations at multi-allelic loci and its implications for investigating identity and paternity. Genetica (2008) 133:107
6. Bright, JA, et al. The variability in likelihood ratios due to different mechanisms. *Forensic Science International: Genetics* (2014),
7. SWGDAM Interpretation Guidelines for Autosomal STR Typing by Forensic Testing Laboratories (2017). Sections 3 and 4.

Requirements to complete module:

Summary of readings
Answers to court question on Statistics in Forensic Science
Quiz

MODULE 28: KINSHIP

Learning objectives:

Mendelian inheritance
Punnett squares and inheritance patterns
Kinship Statistics (paternity index, combined paternity index, probability of paternity, and probability of exclusion)
Basic paternity formulas
Popstats parentage and kinship modules
Reverse paternity, motherless paternity, and other kinship (i.e., relatedness) calculations
Coefficients of relatedness (θ)
Interpreting and reporting parentage testing results
Mutations and mutation rates
Non-autosomal markers and kinship

Reading List:

1. J. Butler. Advanced Topics in Forensic DNA Typing: Interpretation. Chapter 14. Academic Press. 2015.
2. J. Buckleton, CM Triggs, and S Walsh. Forensic DNA Interpretation. CRC Press Chapters 4 and 10.
3. CODIS (current version) Training Material section 6. Available on the CJIS-WAN at: https://10.64.223.136/CODIS-Programs/CODIS-Training.aspx

Requirements to complete module:

Summary of readings
Answers to court question on kinship analysis
Kinship exercises
Quiz

MODULE 29: STRMIX

Learning objectives:

Review of statistics concepts (e.g., mean, mode, standard deviation, variance)
Distributions in statistics (e.g., normal, beta, gamma)
Probability densities
Binary versus continuous models for DNA interpretation
STRmix biological model
Probability of drop-out
Monte Carlo Markov Chain (MCMC) and Metropolis-Hastings
Formulating propositions
STRmix likelihood ratios
Model Maker
STRmix diagnostics
Informed Priors
Variable Number of Contributors
H_d-True Testing
File saving structure

Reading List:

1. STRmix User Manual, latest version
2. STRmix Operations Manual, latest version
3. STRmix Implementation and Validation Guide, latest version
4. Bright, JA, et al. Developmental validation of STRmix™, expert software for the interpretation of forensic DNA profiles. Forensic Science International: Genetics 23 (2016) 226–239

5. Duncan Taylor, Jo-Anne Bright, John Buckleton, The interpretation of single source and mixed DNA profiles. Forensic Science International: Genetics 7 (2013) 516–528
6. Jo-Anne Bright, Duncan Taylor, James M. Curran, John S. Buckleton. Developing allelic and stutter peak height models for a continuous method of DNA interpretation. Forensic Science International: Genetics 7 (2013) 296–304
7. Jo-Anne Bright, Duncan Taylor, James M. Curran, John S. Buckleton. Degradation of forensic DNA profiles, Australian Journal of Forensic Sciences, 45:4, 445-449
8. Duke, KR, Myers, SP. Systematic evaluation of STRmix™ performance on degraded DNA profile data. Forensic Science International: Genetics 44 (2020) 102174
9. Duncan Taylor. Using continuous DNA interpretation methods to revisit likelihood ratio behavior. Forensic Science International: Genetics 11 (2014) 144–153
10. John Buckleton, Hannah Kelly, Jo-Anne Bright, Duncan Taylor, Torben Tvedebrink, James M. Curran. Utilising allelic dropout probabilities estimated by logistic regression in casework. Forensic Science International: Genetics 9 (2014) 9–11
11. Hannah Kelly, Jo-Anne Bright, James Curran, John Buckleton. The interpretation of low level DNA mixtures. Forensic Science International: Genetics 6 (2012) 191–197
12. R.G. Cowell, S.L. Lauritzen, J. Mortera. Probabilistic modelling for DNA mixture analysis. Forensic Science International: Genetics Supplement Series 1 (2008) 640–642
13. D. Taylor a,*, J-A. Bright b, J. Buckleton b, J. Curran. An illustration of the effect of various sources of uncertainty on DNA likelihood ratio calculations. Forensic Science International: Genetics 11 (2014) 56–63
14. Taylor, D et al. Interpreting forensic DNA profiling evidence without specifying the number of contributors. Forensic Science International: Genetics 13 (2014) 269–280
15. Taylor, D, et al. Importance sampling allows H_d true tests of highly discriminating DNA profiles. Forensic Science International: Genetics 27 (2017) 74–81
16. Executive Office of the President President's Council of Advisors on Science and Technology. Report to the President: Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods. September 2016
17. Executive Office of the President President's Council of Advisors on Science and Technology. An addendum to the PCAST report on forensic science in criminal courts. January 2017
18. Bright, J-A, et al. Internal validation of STRmix™ – A multi laboratory response to PCAST. Forensic Science International: Genetics 34 (2018) 11–24

Requirements to complete module:

Summary of readings

Review relevant sections of the Forensic Biology Technical Manual (latest version)

Answers to court question on STRmix

Total allelic product calculations (if not a part of the lecture)

Profile likelihood calculations (if not a part of the lecture)

STRmix Likelihood Ratio Calculations (if not a part of the lecture)

Running training samples from modules 14-25 though STRmix

Quiz

MODULE 30: CODIS

Learning objectives:
Structure of CODIS
Quality assurance requirements for participation in NDIS
DNA records accepted at NDIS, SDIS, and LDIS
Eligibility
Searches at LDIS, SDIS, and NDIS
Search stringency and match criteria
Hit confirmation, dispositioning, and follow-up communications
COSTaR
Match estimator and profile discrimination
Manually searching DNA profiles

Reading List:
1. NDIS Operations Procedures Manual. FBI Laboratory (current version) Sections 1, 2.1, 2.2, 3.1-3.4, 4-4.2, 5, 6, and Appendix D.
2. CODIS (current version) Training Material sections 1-4, 6, 7, and 9.
3. COSTaR validation and modification summaries up to current version
4. NDIS flow chart

Requirements to complete module:
Summary of readings
Review relevant sections of the Forensic Biology Policy Manual (latest version)
Answers to court question on CODIS
Searching exercise
COSTaR exercise
Quiz

MODULE 31: REPORT WRITING

Learning objectives:
Report writing at the SDPD
Populating reports in the FB SIMS
Requirements for reporting quantitative versus qualitative support for associations

Reading List:
1. FB Style Guide
2. Report wording
3. Rare report wording

Requirements to complete module:
Case packet review (at least one discontinued case and one with comparisons/CODIS)
Report writing exercise

Module 32: Technical Review

Learning objectives:
Technical and administrative review requirements

Reading List:
Analytical batch technical review checklist
Case file technical review checklist
Administrative review checklist

Requirements to complete module:
Technical review mock case exercise
Supervised technical and administrative reviews (Analytical Batches and case files)

Module 33: Forensic Biology Specific Court Training

Learning objectives:
Forensic Biology testimony
Kelly-Frye admissibility of evidence standard
Brady v Maryland disclosure requirements
Minimizing bias
Hierarchy of propositions

Reading List:

1. Saferstein. *Forensic Science Handbook, Volume I*, Chapter 1, Prentice Hall Publishing, 1982 (or 2nd ed.2002).
2. J. Butler. Advanced Topics in Forensic DNA Typing: Methodology. Chapter 18. Academic Press. 2011.
3. Baer E. The Effects of Testimony Training on Law Enforcement Officer Self-Assessment of Testimony Skills. LEEF. 15(4) 60-66. 2015
4. People v. Alvin Larry Davis. 75 Cal.App.5th 694 (2022)
5. Chang, W, Ufkes, FJ. Supreme Court clarifies role of trial judge in determining admissibility of expert testimony. California Bar Journal, 2013.
6. Hooper L, Thorpe, S. Brady v. Maryland Material in the United States District Courts: Rules, Orders, and Policies, Federal Judicial Center, 2007
7. Fisher J. The Holdings and Implications of Williams v. Illinois. scotusblog.com (2012)
8. Dror, IE. Subjectivity and bias in forensic DNA mixture interpretation. Science and Justice 51 (2011) 204–208
9. Dror, IE. Practical Solutions to Cognitive and Human Factor Challenges in Forensic Science. Forensic Science Policy & Management, 4(3–4):1–9, 2013
10. Dror, IE. The ambition to be scientific: Human expert performance and objectivity. Science and Justice 53 (2013) 81–82
11. Evett IW, Gill PD, Jackson G, Whitaker J, Champod C. Interpreting small quantities of DNA: the hierarchy of propositions and the use of Bayesian networks. J Forensic Sci 2002;47(3):520–530.
12. vanOorschot, RG, et al. DNA transfer in forensic science: A review. Forensic Science International: Genetics 38 (2019) 140–166
13. Biedermann, A. et al. Evaluation of Forensic DNA Traces When Propositions of Interest Relate to Activities: Analysis and Discussion of Recurrent Concerns. Frontiers in Genetics: Review 12 December 2016 doi: 10.3389/fgene.2016.00215
14. Moretti, T, et al. Erratum: Errors to FBI's STR Population Data Published in 1999 and 2001. J Forensic Sci 2015 Vol 6(4): 1114-1116
15. SDPD Assessment of the Amended FBI STR Database Tables
16. Steffen, C, et al. Corrigendum to 'U.S. Population Data for 29 Autosomal STR Loci' [Forensic Sci. Int. Genet. 7 (2013) e82–e83]. Forensic Science International: Genetics http://dx.doi.org/10.1016/j.fsigen.2017.08.011
17. SDPD memo to DA regarding NIST allele frequency database changes
18. Steffen, C et al. Lessons learned from the characterization of a large set of population samples: identifying and addressing discordance. International Symposium on Forensic Science Error Management. 2015
19. PCAST - Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods (2016), Executive Summary and Sections 5.1-5.2

Requirements to complete module:
Summary of readings
Responses to predicate questions for a DNA analyst
Shadowing of analyst testimony
Quiz

MODULE 34: YSTRS (OPTIONAL)

Learning objectives:
Evolution of the Y-chromosome in humans
Y-chromosome genetics and inheritance
Y-chromosome recombination
Forensic value of the Y-chromosome
Y-chromosome mutations (deletions, duplications, and triplications)
Y-chromosome mutation rates
Y-chromosome resources
Yfiler Plus kit and loci and internal validation
YSTR Interpretation
YSTR Statistics
CA-DOJ Y-Mix Tool (current version)

Reading List:

1. J. Butler. Fundamentals of Forensic DNA Typing. Chapters 16. Academic Press. 2010.
2. J. Butler. Advanced Topics in Forensic DNA Typing: Methodology. Chapter 13. Academic Press. 2012.
3. J. Butler. Advanced Topics in Forensic DNA Typing: Interpretation. Chapter 15. Academic Press. 2015.
4. Yfiler Plus User's Manual
5. Yfiler Plus Validation Summary.
6. D Cornacchia and I Fitch. Introducing Y-STR DNA Testing in the Courts, Profiles in DNA, 9(2): 10-13, 2006.
7. Scientific Working Group on DNA Analysis Methods Guidelines for Y-Chromosome STR Typing 2014
8. Notice to US YSTR Database Users 2018
9. SWGDAM Compliant YHRD User's Guide 2018
10. J Ballantyne *et al.* Creating and managing Effective Y-STR Databases, Profiles in DNA, 9(2): 10-13, 2006.
11. Willuweit, S and Roewer, L. Y chromosome haplotype reference database (YHRD) – Update. Forensic Science International: Genetics 1 (2007) 83–87
12. Gopinath, S. et al. Developmental validation of the Yfiler Plus PCR Amplification Kit: An enhanced Y-STR multiplex for casework and database applications. Forensic Science International: Genetics 24 (2016) 164–175

Requirements to complete module:
Summary of readings
Answers to court question on YSTRs
Case packet review
YSTR Training Samples
Mixture Interpretation Practice Set
Report writing exercise
Written test
Practical competency test
Oral test

Module 35: Legacy Kit Interpretation (Optional)

Learning objectives:
Binary interpretation requirements for Profiler Plus, COfiler, and MiniFiler data from the 3130
STRmix interpretation for Identifiler and Identifiler Plus

Reading List:
1. Validation summary for Profiler Plus and COfiler interpretation thresholds
2. Validation Summary for the Identifiler and Identifiler Plus STRmix parameters
3. Legacy Kit Interpretation Manual (latest version)

Requirements to complete module:
Written test
Practical competency test

Module 36: CODIS Administration (Optional)

Learning objectives:
CODIS specimen data entry, importing, and uploading
CODIS autosearching
Disposition of CODIS matches

Reading List:

1. NDIS Operational Procedures Manual (latest version)
2. CODIS Administrator's Handbook (latest version)
3. CA-DOJ State CODIS Operations Manual (latest version)
4. CA-DOJ Current Accepted Settings (latest version)
5. SDPD CODIS Operations Manual (latest version)
6. NDIS flow chart

Requirements to complete module:

Prior qualification as a DNA analyst at SDPD with interpretation of DNA mixtures
Successful completion FBI sponsored training in CODIS software*
Successful completion of FBI's DNA Auditor training course*
Shadowing a previously qualified CODIS Administrator in the specimen entry, specimen importing, specimen uploading, specimen searching, match disposition, and technical review of CODIS records
Successful specimen entry, specimen importing, specimen uploading, specimen searching, and match disposition of CODIS records supervised by a qualified CODIS Administrator

**An analyst may assume some duties as a CODIS administrator prior to completion of these courses as long as they successfully complete the FBI sponsored training in CODIS software within six months of assuming CODIS administrator duties and successfully complete the FBI's DNA Auditor training course within one year of assuming CODIS Administrator duties.*

ASSESSMENT OF TRAINEES

WRITTEN EXAMINATIONS

Trainees must successfully complete a written examination in serology prior to participating in independent casework in serology.

Trainees must successfully complete written examinations in DNA and STRmix prior to participating in independent casework in DNA testing. Trainees may successfully complete one or more written examinations covering subsets of DNA testing modules prior to participating in independent casework in the areas covered under the tested modules.

Trainees must successfully complete a written examination in YSTRs prior to participating in independent casework in YSTR testing.

Obtaining 80% or higher is required to pass the written exam(s).

MOCK OR ADJUDICATED CASEWORK

Trainees will be expected to conduct analyses and write reports on a series of mock or adjudicated cases that cover a range of cases and sample types that will be encountered in routine casework.

Trainees performing analysis on adjudicated cases will only perform testing on samples that have previously been tested by a qualified analyst. No analysis will be performed on samples or evidence that have not previously been tested by a qualified analyst.

PRACTICAL COMPETENCY TEST

Trainees must successfully complete a practical examination in evidence handling and sampling of a set of samples that cover a range of sample types typically encountered in casework prior to participating in independent casework in evidence handling and sampling.

Trainees must successfully complete a practical examination of a set of samples that cover a range of sample types in serology prior to participating in independent casework in serology. This practical examination may be combined with the practical examination in evidence handling and sampling.

Trainees must successfully complete a practical examination of a set of samples that cover a range of sample types and extractions that will be encountered in routine DNA casework prior to participating in independent casework in DNA testing. Trainees may successfully complete one or more practical examinations covering subsets within the DNA testing modules prior to participating in independent DNA casework in the areas covered under the tested modules. The practical examination(s) in DNA may be combined with the practical examinations in serology and/or evidence handling and sampling.

Trainees must successfully complete a practical examination of a set of samples prior to participating in independent casework in YSTR testing.

Sufficiently documenting analysis, selecting the correct analytical methods for each sample type, using the correct quality assurance procedures (e.g., extracting samples separately that require separate time and/or space), and obtaining the expected genotypes for all tested samples (if applicable) will be designated as passing.

Moot Court or Oral Board

Trainees must successfully complete a moot court or oral board within six months of independent casework analysis. Moot court/oral board is not required for staff who are only sampling evidence and not conducting analysis of evidence items, but a moot court may be offered for those staff members.

A panel of evaluators designated by the DNA Technical Manager will evaluate the trainee's moot court or oral board. Moot courts will be evaluated using the laboratory testimony evaluation form and all members of the panel must give the trainee a passing grade for the trainee to pass the moot court. Passing for oral boards is 80% based upon a scoring rubric designated by the DNA Technical Manager. The final grade for the oral boards will be determined based on the average of the panel of evaluators.

CASEWORK MENTORSHIP

Following completion of the written and/or practical competencies, newly qualified/authorized analysts will be assigned a previously qualified analyst as a mentor for at least the first round of independent casework. Newly qualified/authorized analysts are encouraged to consult with the mentor throughout the analytical, report writing, and technical review processes to assist with the transition to independent casework.

Forensic Biology Unit Training Check List

Module	Date Completed	Trainee Initials	Assigned Trainer Initials
1 FB Quality Assurance			
Required Reading			
Analyst Transcripts provided to DNA Technical Manager			
Training on Criminal and Civil Law			
Lectures			
Trainee Responsibility			
Summary of readings			
Pipetting and dilution exercise			
FB Quality Assurance Exam (Power DMS)			
2 Evidence Handling			
Required Reading			
Lecture			
Firearms Safety Demonstration			
File-on-Q/SART-on-Q/LabOnQ Training			
Trainee Responsibility			
Summary of readings			
Analyst shadowing (chain of custody transfers)			
Property Room Tour			
Quiz			
3 Evidence Sampling			
Required Reading			
Lecture			
Trainee Responsibility			
Summary of readings			
Answer court questions on evidence sampling			
FB SIMS Training			
Derivative evidence in File-on-Q			
Analyst shadowing sampling evidence (evidence swab)			
(reference mouth swab)			
(sexual assault examination kit)			
(clothing)			
(firearm)			
(rock, drinking container, tool, or other handled item)			
Sampling of mock type evidence items			
Quiz			
Practical Competency (Evidence Handling and Sampling)			
Practical examination			

Technical Manager Review Initials and Date: _____

Forensic Biology Unit Training Check List

Module	Date Completed	Trainee Initials	Assigned Trainer Initials
4 Serology - Blood			
Required Reading			
Lectures			
Demonstration of methods			
Trainee Responsibility			
Summary of readings			
Answer court questions on blood ID and BSP ID			
Analyst shadowing			
Presumptive blood test sensitivity/specificity			
Blood confirmation sensitivity/specificity			
Blood testing and bloodstain pattern exercise			
Summary of training exercises			
Case packet review (blood testing)			
Quiz			
5 Serology - Semen			
Required Reading			
Lecture			
Demonstration of methods			
Trainee Responsibility			
Summary of readings			
Answer court questions on Semen ID			
Analyst shadowing			
ALS sensitivity/specificity			
Presumptive semen test sensitivity/specificity			
p30 and Microscopic examination sensitivity/specificity			
Summary of training exercises			
Case packet review (semen testing)			
Semen testing exercise			
Quiz			

Forensic Biology Unit Training Check List

Module	Date Completed	Trainee Initials	Assigned Trainer Initials
6 Serology - Saliva and other biologicals			
Required Reading			
Lecture			
Demonstration of methods			
Trainee Responsibility			
Summary of readings			
Answer court questions on saliva testing			
Saliva testing sensitivity/specificity exercise			
Summary of training exercises			
Quiz			
7 Serology - Interpretation Guidelines			
Lecture			
Trainee Responsibility			
Review of Technical Manual: Serological Interpretation Guidelines			
Quiz			
Written Examination (serology)			
Written examination			
Mock/Adjudicated Cases (serology)			
Batch 1:			
Batch 2:			
Batch 3:			
Practical Competency (serology)			
Practical examination			
Moot Court or Oral Board (serology)			
Moot court or Oral Board			

Technical Manager Review Initials and Date: _____

Forensic Biology Unit Training Check List

Module	Date Completed	Trainee Initials	Assigned Trainer Initials
8 Historical Perspectives of Forensic DNA Analysis			
Required Reading			
Lecture			
Trainee Responsibility			
Summary of readings			
Quiz			
9 DNA extraction/purification			
Required Reading			
Lecture			
Demonstration of methods: (general DNA extraction)			
(reference sample extraction)			
(cartridge case extraction)			
(differential extraction)			
(non-differential extraction of sexual assault evidence)			
(hair extraction)			
(bone extraction - optional)			
Trainee Responsibility			
Summary of readings			
Answer court questions on extraction/purification			
Analyst shadowing - EZ1			
Reagent Blank quiz			
General DNA and Reference Sample extractions (4 each)			
Quiz			

Forensic Biology Unit Training Check List

Module	Date Completed	Trainee Initials	Assigned Trainer Initials
10 DNA quantification			
Required Reading			
Lecture			
Demonstration of methods			
Trainee Responsibility			
Summary of readings			
Answer court questions on quantification			
Analyst shadowing - Manual			
Analyst shadowing - Nimbus			
Written quantitation exercise			
Quantitation of previously extracted samples (manual and Nimbus)			
Quiz			
11 PCR amplification			
Required Reading			
Lecture			
Trainee Responsibility			
Summary of readings			
Answer court questions on amplification			
Analyst shadowing - Manual			
Analyst shadowing - Nimbus			
Analyst shadowing - Concentration/Dilutions			
Exercise on determining amplification volume			
Amplification of previously extracted samples (manual and Nimbus)			
Quiz			

Forensic Biology Unit Training Check List

Module	Date Completed	Trainee Initials	Assigned Trainer Initials
12 Short Tandem Repeats (STR's)			
Required Reading			
Lecture			
Trainee Responsibility			
Summary of readings			
Answer court questions on STRs			
Quiz			
13 Capillary electrophoresis			
Required Reading			
Lecture			
Demonstration of 3500 maintenance			
Demonstration of method (manual and QIAgility)			
Trainee Responsibility			
Summary of readings			
Answer court questions on CE			
Analyst shadowing (manual)			
Analyst shadowing (QIAgility)			
Capillary Electrophoresis of previously extracted samples (manual and QIAgility)			
Quiz			
14 Data Analysis			
Required Reading			
Lecture			
Demonstration of method			
Trainee Responsibility			
Summary of readings			
Answer court questions on data analysis			
Analyst shadowing			
Analytical batch reviews			
GMID-X Troubleshooting Exercise			
Data analysis of previously extracted samples			
Quiz			

Forensic Biology Unit Training Check List

Module	Date Completed	Trainee Initials	Assigned Trainer Initials
15 Interpretation Part 1: SS Samples			
Required Reading			
Lecture			
Trainee Responsibility			
Summary of readings			
Answer court questions on SS sample interpretation			
Quiz			
16 DNA Analysis of Blood Samples			
IMPORTANT NOTE: During analysis of training samples, trainees must ensure that when multiple instruments are available or methods can be completed manually or robotically, that each available instrument is used or process is performed at some point during the training. Analysts should indicate on the checklist what instrumentation or whether manual or robotic setup of was used.			
Trainee Responsibility			
Analysis of blood samples (ext through GMID-X)			
Case packet review (DNA analysis of single source samples)			
17 DNA Analysis of Reference Mouth Swabs			
Trainee Responsibility			
Analysis of reference mouth swabs (ext through GMID-X)			
18 DNA Analysis of Hair			
Trainee Responsibility			
Analysis of hair samples (ext though GMID-X)			
19 DNA Analysis of Cigarette Butts			
Trainee Responsibility			
Analysis of cigarette butts (ext through GMID-X)			
20 DNA Analysis of Bone (optional)			
Trainee Responsibility			
Analysis of bone samples (ext through GMID-X)			

Forensic Biology Unit Training Check List

Module	Date Completed	Trainee Initials	Assigned Trainer Initials
21 Interpretation Part 2: Mixtures			
Required Reading			
Lecture			
Trainee Responsibility			
Summary of readings			
Answer court questions on mixture analysis			
Number of Contributors Assumptions Exercise			
Quiz			
22 DNA Analysis of Mixed Samples			
Trainee Responsibility			
Analysis of mixed samples (quantification through GMID-X)			
23 DNA Analysis of Sexual Assault Evidence			
Demonstration of method - QIAcube differential extraction (with and without lysis protocol)			
Demonstration of method - manual differential extraction			
Demonstration of method - non-differential extraction			
Trainee Responsibility			
Analysis of QIAcube differentials (ext through GMID-X)			
Analysis of non-differentials (ext through GMID-X)			
24 DNA Analysis of Touch/Wearer Samples			
Demonstration of method			
Trainee Responsibility			
Analysis of touch/wearer (ext through GMID-X) (at least one firearm should be included)			
25 DNA Analysis of Cartridge Cases			
Demonstration of method			
Trainee Responsibility			
Analysis of casings (ext through GMID-X)			
Cartridge Case Exercise			

Forensic Biology Unit Training Check List

Module	Date Completed	Trainee Initials	Assigned Trainer Initials
26 Population genetics			
Required Reading			
Lecture			
Trainee Responsibility			
Summary of readings			
Answer court questions on population genetics			
Quiz			
27 Statistics in Forensic DNA			
Required Reading			
Lecture			
Trainee Responsibility			
Summary of readings			
Answer court questions on statistics			
Quiz			
28 Kinship			
Required Reading			
Lecture			
Trainee Responsibility			
Summary of readings			
Answer court questions on kinship			
Kinship exercises			
Quiz			

Forensic Biology Unit Training Check List

Module	Date Completed	Trainee Initials	Assigned Trainer Initials
29 STRmix			
Required Reading			
Lectures			
Trainee Responsibility			
Summary of readings			
Answer court questions on STRmix			
Total allelic product calculations			
Profile likelihood calculations			
LR calculations			
Running training samples (module 14-25) through STRmix			
Quiz			
30 CODIS			
Required Reading			
Lecture			
Trainee Responsibility			
Summary of readings			
Answer court questions on CODIS			
Searching exercise			
COSTaR exercise with training samples			
Quiz			
31 Report Writing			
Required Reading			
Lecture			
Trainee Responsibility			
Case Packet Reviews (focus on report writing)			
Report writing exercise			

Forensic Biology Unit Training Check List

Module	Date Completed	Trainee Initials	Assigned Trainer Initials
32 Technical Review			
Lecture			
Trainee Responsibility			
Technical review mock case exercise			
Supervised Technical and Administrative Reviews			
33 FB Specific Court Training			
Required Reading			
FB specific court issues lecture			
Trainee Responsibility			
Summary of readings			
Compose responses to predicate court questions provided			
Shadowing			
(please indicate case number for testimony observed)			
Quiz			

DNA Assessment

Written Examinations			
DNA			
STRmix			
Mock/Adjudicated Cases			
Batch 1:			
Batch 2:			
Batch 3:			
Practical Competency test			
Practical Examination			
Moot Court/Oral Board			
Moot Court/Oral Board			

Technical Manager Review Initials and Date: _____

Forensic Biology Unit Training Check List

Module	Date Completed	Trainee Initials	Assigned Trainer Initials
34 YSTRs (Optional)			
Required Reading			
Lecture			
Trainee Responsibility			
Summary of readings			
Answers to court questions on YSTRs			
Case packet review (Y-STR cases)			
Yfiler Plus training samples			
YSTR mixture interpretation practice set			
Report writing exercise			
Written Examination			
Written examination			
Practical Competency			
Practical examination			
Oral Examination			
Oral examination			

Technical Manager Review Initials and Date: _____

Forensic Biology Unit Training Check List

Module	Date Completed	Trainee Initials	Assigned Trainer Initials
35 Legacy Kit Interpretation (Optional)			
Required Reading			
Lecture			
Trainee Responsibility			
Legacy kit training samples			
Written Examination			
Written examination			
Practical Competency			
Practical examination			

Technical Manager Review Initials and Date: _____

36 CODIS Administration (Optional)			
DNA Technical Manager review of education & experience			
Required Reading			
Trainee Responsibility			
CODIS Admin Shadowing			
Tech Review of CODIS match dispositions (single source)			
(partials)			
(mixtures)			
Specimen entry/import, upload, autosearch, and match disposition supervised by CODIS Admin			

Technical Manager Review Initials and Date: _____

Forensic Biology Unit - Training Module Evaluation Form

Name: _____ Training Module: _____

Module Start Date: _____ Current Date: _____

Completion of reading summaries: ☐ Yes ☐ No ☐ N/A

Completion of exercises: ☐ Yes ☐ No

Completion of court question: ☐ Yes ☐ No ☐ N/A

Training Feedback:

☐ Successful completion of module ☐ Further training required (see above)

Analyst Initials and Date: _____ Trainer Initials and Date: _____

SAN DIEGO POLICE DEPARTMENT CRIME LABORATORY
Laboratory Technician - Initial Training Checklist

	Instructor	Trainee	Date
General Duties			
Ordering supplies through ARIBA			
Ordering QIAGEN and Life Technologies supplies			
Receiving deliveries from E Street counter			
Recycling			
Location of Safety Data Sheets (lab and unit)			
Basic Forensic Biology Duties			
Weekly inventory of kits, reagents, and supplies			
Receiving general laboratory supplies and chemicals			
Receiving quantification and amplification kits			
Eyewash station flushing			
Weekly safety inspection			
Refrigerator and freezer monitoring			
Weekly laboratory space cleaning			
Weekly cleaning of laboratory equipment			
Washing, drying, and storage of labwares (glass and plastics)			
Water purification system			
Autoclave			
Reagent preparation			
Ordering service for lab equipment			
Instruments			
Evidence collection kits			
Ordering SAFE kits			
Biological stain/evidence collection			
Reference mouth swab			
Hazardous waste disposal			
Restocking of supplies in Forensic Biology			
Lab Discovery			

Review of DNA Technical Manager _____

SAN DIEGO POLICE DEPARTMENT CRIME LABORATORY
Laboratory Technician - Technical Duties Training Checklist

	Instructor	Trainee	Date
EZ1 Maintenance			
EZ1 volume checks			
EZ1 cleaning and o-rings			
QIAcube maintenance			
Monthly			
Semi-annual			
Nimbus cleaning and maintenance			
3500 maintenance			
Weekly			
Bi-weekly			
Monthly			
Corbett/QIAgility verification			
QuantStudio 5 verification			
Regions of Interest (ROI)/Uniformity			
Background Calibration			
Dye calibration (system and custom dyes)			
RNAse P			
Block decontamination			
Self Verification			

Review of Technical Manager _____

Training Checklist - 3500 Maintenance

Training Record For: _____

3500 Maintenance Required Reading

Applied Biosystems 3500/3500xL Genetic Analyzer with 3500 Series Data Collection Software 3.1	Initials/date: _____
SDPD Technical Manual - 3500 Genetic Analyzer Instrument Preparation, Maintenance, and Calibration	Initials/date: _____

3500 Instrument Maintenance Training

	Maintenance Observation		Supervised Maintenance
Array changes	Date: _____	Initials: _____	Trainer initials and date: _____
Spatial calibration	Date: _____	Initials: _____	Trainer initials and date: _____
Spectral calibration	Date: _____	Initials: _____	Trainer initials and date: _____
Buffer Changes	Date: _____	Initials: _____	Trainer initials and date: _____
Computer restart	Date: _____	Initials: _____	Trainer initials and date: _____
Pump flush	Date: _____	Initials: _____	Trainer initials and date: _____
Weekly wash	Date: _____	Initials: _____	Trainer initials and date: _____
Polymer replacement	Date: _____	Initials: _____	Trainer initials and date: _____
Bubble Removal	Date: _____	Initials: _____	Trainer initials and date: _____

Training Verification

DNA Technical Manager: _____ Date: _____