# MASTER DOCUMENT LIST

## 1 Overview

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<td>Overview of CODIS Training Program</td>
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<tr>
<td>CO-TM-02</td>
<td>Introduction to CODIS / History of CODIS Program</td>
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## 2 General DNA Training

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## 3 CODIS Technician Unit

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## 4 CODIS Analyst Unit

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<td>CO-TM-CA-05</td>
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5 Robotics Modules (Optional)

CO-TM-ROBOT-01 Automated Blood Spotting Onto Archive Cards/Archive Plates

CO-TM-ROBOT-02 Automated DNA Extraction – EZ1

CO-TM-ROBOT-03 Automated DNA Extraction – BioSprint 96

CO-TM-ROBOT-04 Automated DNA Quantitation

CO-TM-ROBOT-05 Automated DNA Normalization

CO-TM-ROBOT-06 Buccal Lysis Set-up

CO-TM-ROBOT-07 BSD-600 Operation

CO-TM-ROBOT-08 Automated DNA Extraction Using the QIAsymphony

Forms

LAB-CO-20 CODIS Analyst Training Checklist

LAB-CO-42 CODIS Technician Training Checklist

LAB-CO-47 CODIS Advanced Robotics Checklist
### Revision History

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<td>04</td>
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**Effective Date: 02/16/2018**  
**Issued by: QA Coordinator**
OVERVIEW OF CODIS TRAINING PROGRAM

1 Introduction

This document is intended to serve as a training aid to qualified CODIS analysts, CODIS technicians, and CODIS interagency liaisons. It is meant to give each employee a common starting point and a better understanding of each of the steps involved in processing database samples.

The primary trainer will judge the successful completion of each module by either observation or a written exam. Only then will the trainee proceed to the next module. Not all modules will be necessary for all employees. Each employee will be trained based on their position and/or specialized duties assigned for those employees.

Each employee should be given sufficient time to review required reading materials before being tested on a module. Supplemental reading materials may be assigned at the discretion of the trainer.

CODIS personnel employed by the Texas Department of Public Safety must meet the standards outlined in The FBI Quality Assurance Standards Audit for DNA Databasing Laboratories before receiving approval to perform independent DNA testing. These qualifications include education, DNA experience, and training requirements.

1.1 Educational Requirements

A. CODIS Analysts shall have at a minimum a BS or BA degree in biology, chemistry, forensic science, or related area.

B. CODIS Analysts must have completed nine or more cumulative semester or equivalent hours in college course work covering the subject areas of biochemistry, genetics, and molecular biology.

C. CODIS Analysts shall have course work and/or training in statistics and population genetics as it applies to forensic DNA analysis.

1.2 Experience/Training Requirements

A. CODIS Analysts shall have a minimum of six (6) months of human- DNA laboratory experience with at least three months in a forensic or database DNA laboratory.

B. Prior to independent work using DNA technology, CODIS analysts shall complete the successful analysis of a range of samples routinely encountered in database analysis.

C. CODIS Analysts shall have successfully completed a competency test before beginning independent DNA analysis.

D. CODIS personnel shall have successfully completed documented training specific to his or her job function(s).

2 Purpose

The CODIS training program is intended to provide the trainee with sufficient background, laboratory skills, education, competency, and supervised hands-on experience to adequately perform their duties with minimal supervision and meet the FBI Quality Assurance Standards. Trainees having prior forensic or DNA database experience may complete a modified training program provided that the Technical Leader evaluates, approves and documents the adequacy of the previous training. Any adjustments to the
The training program must be justified in writing in the trainee’s notebook by the trainer and Technical Leader and specifically approved by the Quality Assurance Coordinator. Regardless of previous experience, analysts must successfully complete a competency test covering the routine DNA methodologies to be used prior to participating in independent database analysis.

3 Organization

The training program is divided into three CODIS units and two General Laboratory Units, each consisting of a set of modules.

A. General Laboratory Training - Fundamentals Unit - Introduces the trainee to general laboratory practices, forensic science, quality assurance, general laboratory safety, ethics, and department and laboratory policy.

B. General Laboratory Training - Forensic Legal Unit - Introduces the trainee to basic court testimony, an overview of the court structure and legal processes, and laboratory significant legal opinions.

C. CODIS Technician Unit - Introduces the trainee to sample receiving and handling, data entry, AFIS verification, sample preparation and storage, and blood tube destruction.

D. CODIS Analyst Unit - Introduces the trainee to basic extraction, amplification, capillary electrophoresis, and data interpretation.

E. CODIS Advanced Robotics Unit – Introduces the trainee to the operation of robotic instruments. The CODIS Advanced Robotics Unit is optional. Approval is granted individually for each module completed within the unit.
   1. Automated blood spotting
   2. Automated buccal lysis set-up
   3. QIAsymphony SP Extraction
   4. BSD 600 Operation

4 Assignment of Trainer

The Technical Leader is responsible for reviewing and approving the training program for the CODIS Section. The CODIS Program Manager, or other designee, may assign a trainer(s) to the trainee for general laboratory assistance, for instruction in procedures, and for laboratory practicals and assessments. Meetings between the trainee, the trainer, Technical Leader, and/or CODIS Program Manager should be held periodically in order to evaluate the trainee’s progress, plan future assignments, and discuss any deficiencies which may require additional training.

5 Trainer Responsibilities

The trainer(s) conducts training on assigned modules and reviews the completion of training requirements and training records. CODIS Analysts only - The trainer reviews the analyst’s competency notebook and recommends approval for supervised analysis to the Technical Leader.

6 Trainee Responsibilities

The training program requires the trainee to keep up with reading assignments on a self-study basis. The trainee is responsible for informing his/her trainer or Technical Leader
when problems arise at any time during the training period. The trainee will document their progress on the appropriate training checklist (LAB-CO-20, LAB-CO-42, or LAB-CO-47). The trainee will also be required to keep a training notebook and successfully complete all exams and competency samples (if applicable).

7 Training Records

7.1 CODIS Training Checklist

Completion of modules, including readings, supervised lab work, and/or written/practical examinations will be recorded, dated, and signed off by the trainer on the appropriate training checklist (LAB-CO-20, LAB-CO-42, or LAB-CO-47). When the training concludes, the trainee and trainer will complete and sign-off the applicable checklist.

7.2 Training Notebook

A. The trainee is responsible for keeping detailed records in a training notebook of his/her training including examination results (when applicable).

B. The following is a list of items maintained in the training notebook by the trainee:
   1. CODIS training checklist, as applicable (LAB-CO-20, LAB-CO-42, or LAB-CO-47)
   2. Written examinations
   3. Competency tests and results (Analysts only)
   4. Comprehensive written exam (Analysts only)

7.3 Retention of Training Records

The laboratory will maintain the completed training records of the trainee according to the DPS Records Retention Schedule.

8 Unit Assessment

CODIS personnel are required to take the General Laboratory Training Fundamentals Unit and General Laboratory Training Forensic Legal Unit. Completion of the General Laboratory Training is documented with a Certification of Completion (LAB-QA-31).

Not all CODIS training modules will be necessary for every employee. Each employee will be trained based on their position and/or specialized duties assigned.

8.1 CODIS Technician Unit

Completion of the CODIS Technician Unit is documented with a Certification of Completion (LAB-QA-31) when the following are met:

1. Supervised performance relating to sample receiving and handling.
2. Satisfactory completion of the CODIS Technician modules.

8.2 CODIS Analyst Unit

Completion of the CODIS Analyst Unit is documented with a Certification of Competency (LAB-QA-03) when the following are met:

1. At least six months of supervised DNA training.
2. Satisfactory completion of the CODIS Analyst modules.
3. Satisfactory completion of DNA competency samples utilizing the STaCS test server.
4. Satisfactory completion of the CODIS Analyst Checklist (LAB-CO-20)
5. Successful completion of a comprehensive written exam.
6. The training notebook is approved by the trainer and the Technical Leader.
7. Mock trial is optional based on duties assigned.

8.3 Supervised Analysis
Supervised analysis requirements will conclude with approval for Independent Work Authorization (LAB-QA-13) when the following are met:

1. Supervised analysis consists of analyzing a minimum of three full plates of database samples. This is documented using the Supervised Casework Log (LAB-QA-27). Trainer must initial the Analysis Forms (LAB-CO-05) indicating that they have reviewed the results with the trainee.
2. When the trainer(s) are satisfied with the performance of the analyst, they may recommend that the examiner be approved for independent work to the Technical Leader.

8.4 CODIS Advanced Robotics Modules
CODIS Advanced Robotics modules will conclude with approval to operate the appropriate robotic workstation when the following are met:

1. Supervised performance on the respective robotic workstation using database samples.
2. Supervised performance of required maintenance operations on robotic workstations if applicable.
3. Satisfactory completion of DNA competency samples utilizing the STaCS test server.
4. Satisfactory completion of the appropriate CODIS Advanced Robotics Module.

9 Evaluation of Training Program
After the training has concluded, the trainee will complete the Laboratory Training Program Evaluation Form (LAB-QA-21).
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INTRODUCTION TO CODIS / HISTORY OF CODIS PROGRAM

Duration 2 to 4 days

Purpose To introduce the trainee to the history of the CODIS program and the laws that impact CODIS sample collection

Prerequisite CO-TM-01 Overview

1 Scope

Texas DPS implemented the Combined DNA Index System (CODIS) on September 1, 1995, in accordance with Texas Government Code Title 4 Subtitle B §411.142. The principal purpose of this system is to assist federal, state, and local criminal justice and law enforcement agencies in the investigation and/or prosecution of CODIS eligible offenses in which biological evidence is recovered.

The State CODIS Program is responsible for establishing and maintaining a computerized database that serves as the State’s central depository for DNA records. The State DNA Database, consisting of several authorized categories of DNA records, is housed and maintained by the State CODIS Laboratory at the Texas Department of Public Safety Crime Laboratory in Austin.

2 Objectives

2.1 Theoretical

Following the completion of training, the trainee will be able to:

1. List the three major components of the criminal justice system and how they interact with each other.
2. Be familiar with the process of developing a DNA profile from biological material.
3. Explain the importance of using comparisons in forensic DNA analysis.
4. List the major developments in forensic DNA typing.
5. Explain why DNA databases are so effective.
6. Define and explain the difference between database, databank, and population database.
7. List the four components that make a database effective.
8. Describe how forensic databases work.
9. List and describe the three tiers that make up the CODIS database.
10. Define CODIS and describe its purpose.
11. Define the following terms and explain the differences between them: convicted offender index, forensic index and arrestee index.
12. List the information stored in CODIS.
13. List information not stored in CODIS.
14. Describe how NDIS ensures that quality data is being put into the database.
15. Explain who has access to CODIS.

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16. Explain how the success of CODIS is measured.
17. Describe the difference between a forensic hit and an offender hit and what information they provide to the investigation.
18. Describe the process of following up a “cold hit.”
19. Explain why “hit confirmation” is so important.
20. Describe other uses for DNA databases.
21. Be familiar with the federal and state laws that impact CODIS.
22. List concerns people have with DNA databases.
23. Describe how privacy concerns are addressed in CODIS.
24. List the policies in place that ensure privacy is maintained within CODIS.
25. Explain the justification for sample retention.

3 Training Outline

3.1 Lesson Plan

A. Overview and History of DNA Typing (Butler)
   1. Overview of the Criminal Justice System
   2. Overview of Forensic DNA Analysis
      a) Basic principles
      b) Steps in DNA sample processing
      c) Profile comparisons
      d) Major historical events

B. DNA Databases (Butler)
   1. Value of DNA Databases
   2. Database vs. Databank
   3. Aspects of a National DNA Database
   4. The U.S. National Database
      a) Three tiers
      b) CODIS software
      c) Indices
      d) Stored information
      e) Assurance of quality data
      f) CODIS users
      g) Measurement of success
      h) Searches
      i) Hit confirmation
5. Issues and Concerns with DNA Databases
   a) Privacy concerns
   b) Sample retention

6. Other uses for DNA Databases
   a) Missing persons
   b) Partial matches and familial searching

C. DNA Database Laws

1. Federal Laws
   a) DNA Identification Act of 1994
   b) DNA Analysis Backlog Elimination Act of 2000
   c) Justice for All Act of 2004
   d) DNA Fingerprint Act of 2005
   e) Katie Sepich Enhanced DNA Collection Act of 2012

2. State Laws
   a) House Bill 40
   b) House Bill 1188
   c) Senate Bill 368
   d) Senate Bill 1380
   e) House Bill 588
   f) House Bill 562
   g) House Bill 1068
   h) House Bill 867
   i) Senate Bill 727

3. Legal Challenges to DNA Database Laws
   a) Maryland v. King
   b) People v. Buza

3.2 Required Readings

Overview. CODIS SOP (CO-01-01). Texas Department of Public Safety Crime Laboratory.
Sample Collection and Handling (CO-02-01, Section 2). CODIS SOP, Texas Department of
Public Safety Crime Laboratory.
Chapter 1: Overview and History of DNA Typing
Chapter 12: DNA Databases
Texas CODIS Legislation History (handout)
3.3  **Suggested Readings**


4  **Practice**

None

5  **Assessment**

5.1  **Competency and Qualifying Examination**

The trainer will administer a written examination. Incorrect responses will be reviewed and/or remediated with the trainee.

Successful completion of this module is determined by the trainer.
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INTRODUCTION TO DNA - HISTORY OF FORENSIC DNA ANALYSIS

Duration 2 to 4 days

Purpose Enable a trainee to communicate with appropriate forensic DNA terms. Educate a trainee on the earlier procedures and advances in forensic DNA.

Prerequisite None

1 Objectives

1.1 Theoretical

The ability to understand and use proper biological terminology is necessary for successful communications in both the forensic field and in the courtroom. The history of the development and past methods in human identification testing will provide the trainee with a foundation of the concepts and the procedures used in the laboratory for forensic DNA testing.

1.2 Practical

Following the completion of training the trainee will be able to:

1. Define and understand basic genetic, heredity, and forensic DNA typing terms.
2. Discuss from a historical point of view the major developments in forensic DNA.
3. Describe the limitations of DNA analysis.

1.3 Theory

A successful analyst will be aware of the historical significance DNA testing has had in forensic science. By studying the development of DNA analysis in forensic science, an analyst will understand the motives and theory behind the work being performed in the CODIS laboratory.

2 Training Outline

2.1 Lesson Plan

I. Introduction to forensic DNA (1;3 chapter 1;4 chapter 1-3)
   A. Definition, importance, legal value
   B. The scientific basis of DNA typing
   C. Other areas utilizing DNA typing techniques

II. Overview of forensic DNA typing systems (2, chapter 5)
   A. RFLP
   B. PCR - HLA Dqα and D1S80
   C. PCR – STR
   D. Mitochondrial DNA

III. Procedures for forensic DNA analysis (2, chapter 6; 7, pg 6-13)
   A. Isolation of DNA
   B. Determining quality and quantity of DNA
   C. PCR amplification
D. Analysis of PCR product

IV. Human Identity Testing Chronology (5)

V. CODIS History (6)

2.2 Required Readings

1. CODIS Standard Operating Procedures. CO-01-01. Texas Department of Public Safety Crime Laboratory.


6. CODIS History Handout.


3 Practice

3.1 Supervised Performance

None

4 Conclusion

4.1 Test Assessment

Written test.

4.2 Additional requirements

Successful completion of this module is determined by the trainer and is a prerequisite for remaining technician and analysis modules.

Human Identity Testing Chronology

1983 Kary Mullis at Cetus in Emeryville, CA invents PCR

1985 PCR paper published by Saiki, Scharf, Faloona, Mullis, Horn, Erlich, Arnheim

Cetus Forensic R + D program begins (Henry Erlich, Russ Higuchi, Ed Blake, Vince Phillips, Randy Saiki)

1986 First PCR DNA case in U. S. criminal court (PA vs. Pestinikas) using HLA DQα typing results

Kary Mullis leaves Cetus after having received a $10,000 bonus for his invention to move to La Jolla, CA and serve as a consultant on PCR for
Human Identity Testing Chronology

several biotech firms

Nov 1988 Perkin-Elmer-Cetus Instruments introduce the DNA Thermal Cycler in the U. S

1988 FBI evaluation of HLA DQα system begins

Paper regarding the use of a thermostable enzyme in PCR published (Saiki, Gelfand, Stoffel, Scharf, Higuchi, Horn, Mullis)

1989 Cetus begins field trials of AmpliType® HLA DQα kit

Hoffman-La Roche in New Jersey purchases a license from Cetus to use PCR to develop diagnostic kits and forms Roche Diagnostic Research (RDR) eventually in Alameda, CA

1990 AmpliType® HLA DQα kit introduction: U.S. in February; international in March (Cetus manufactures and markets kits; Perkin-Elmer distributes them) Kristin Garvin joins marketing and Rebecca Reynolds join R + D at Cetus

Apr 1991 D1S80 Forensic DNA Amplification Reagent Set introduced

Nov 1991 Hoffmann-La Roche buys the rest of the rights to PCR from Cetus for $300 million dollars RDR becomes Roche Molecular Systems (RMS) to mark that change

RMS and Perkin-Elmer form a strategic alliance where RMS does R + D and manufacturing of human identity products and Perkin-Elmer markets and distributes the products.

PCR division of Cetus moves to RMS (this includes Rebecca Reynolds, Henry Erlich, Randy Saiki, Sean Walsh, Nicky Fildes, David Gelfand, Vince Phillips, Russ Higuchi) and Kristin Garvin moves to Perkin-Elmer

AmpliType Training Course Program moves to RMS

The noon-PCR division of Cetus merges with Chiron; Cetus no longer exists

1992 FBI begins using AmpliType® HLA DQα kit on casework

Jan 1992 Fluorescent STR research started at Applied Biosystems; Applied Biosystems, founded in 1981, makes automated instruments for DNA sequencing, DNA synthesis, peptide synthesis and protein sequencing

TXDPS DNA Lab evaluation of PCR (Headquarters and Field) and RFLP (Headquarters)

Mar 1992 Judy Allen joins RMS Training group (PCR Information Network)
Human Identity Testing Chronology

Oct 1993  Perkin-Elmer merges with Applied Biosystems, Incorporated in Foster City, CA

Merging with Applied Biosystems, Inc. makes Perkin-Elmer the exclusive source of PCR-based fluorescent and non-fluorescent DNA typing systems

1993 Apr  Quantiblot™ Human DNA Quantitation Kit introduced

June  AmpliFLP™ D1S80 PCR Amplification Kit, GeneAmp® Detection Gel introduced

Oct  Kary Mullis wins Nobel Prize in Chemistry

AmpliType® PM kit introduced

PM goes to court (George Herrin, Georgia bureau of Investigation)

1994 DPS Starts Accepting DNA Casework initially RFLP (Headquarters) and then PCR (Headquarters and Field)

Jan  Roche Molecular Systems begins R + D on STRs

AmpliType Training Course Program moves to Applied Biosystems Division of Perkin-Elmer Training Department. Judy Allen offered a position there to continue Forensic PCR workshops. Frank Stephenson, Manager of Training Dept. becomes a co-instructor

Apr  FBI begins using AmpliType® PM kit on casework

Cellmark offering AmpliType® PM kit on casework

Sept  AmpliType® PM+DQA1 kit available

Nov  Perkin-Elmer introduces the Personal Thermal Cycler 2400

Work on mitochondrial DNA PCR amplification and typing by immobilized probe kit started at Roche Molecular Systems

1995 June  RMS STR R+D moved to PE-ABD; Sean Walsh from RMS R+D joins PE-ABD

Forensic R+D to continue working on STRs

Aug  Work on a PM II PCR amplification and typing kit started at Roche Molecular Systems

Oct  ABI PRISM STR Primer Set available

1997 Sept  DPS begins using STR testing on CODIS offender batchwork

1998 Sept  DPS begins using STR testing on forensic casework
Training Manual
CODIS
Subject: Introduction to DNA

Preparer

Gary Molina

Date: 12/16/2009
CODIS State Manager

Concurrence

Zoë M. Smith

Date: 12/16/2009
Quality Assurance Specialist

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Effective Date: 01/04/2010
Issued by: QA Coordinator
BLOOD SAMPLE COLLECTION AND HANDLING

Duration 2 to 4 days

Purpose The trainee will learn how to properly receive and evaluate blood samples for acceptance into the CODIS laboratory.

Prerequisite GLT-TM-FUN-02 General Safety, CO-TM-02 Introduction to CODIS / History of CODIS Program

1 Scope

All CODIS samples should be collected in accordance with the CODIS DNA Procedural Guidelines (LAB-11) and subjects shall be collected in accordance with State laws. This module presents the minimum standards for accepting samples in the CODIS laboratory.

2 Objectives

2.1 Theoretical

Following the completion of training, the trainee will be able to:

1. List the information that is recorded on the DNA Database Card during collection
2. Describe the reasons for rejecting a blood sample and how to document the reject
3. List the information collected when taking orders for blood collection kits

2.2 Practical

Following the completion of training, the trainee will be able to:

1. Print CODIS barcode labels using STaCS
2. Prepare labeled blood tube racks for storage
3. Process and screen blood kits for acceptance
4. Properly package and ship blood kit orders
5. Scan/save court orders/paperwork submitted with blood kit

3 Training Outline

3.1 Lesson Plan

A. Blood Receiving and Storage

1. Printing CODIS barcode labels
2. Preparing blood tube racks for storage
3. Processing blood kits
   a) Checking for appropriate seal
   b) Checking contents of kit
   c) Determining whether a kit is accepted/rejected
      i. Blood tube labeled appropriately
ii. Blood collection tube has at least 0.5 cm of blood
iii. Readable thumbprints on DNA Database Card
iv. Blood tube information matches DNA Database Card

d) Placing barcode label on DNA Database Card and blood tube

4. Storing blood tubes
5. Scanning/saving court orders and other additional paperwork submitted with the collection kit

B. Processing blood kit orders
   1. Receiving kit order list from CODIS Liaison
   2. Preparing packing slip
   3. Preparing appropriate mailing label
   4. Packing the appropriate items into a shipping box
   5. Sealing, affixing labels, and placing box(es) for mail pick-up
   6. Initialing and dating kit order list and returning to CODIS Liaison

3.2 Required Readings


Sample Collection and Handling (CO-02-01, Sections 3-5). CODIS SOP. Texas Department of Public Safety Crime Laboratory.

CODIS DNA Procedural Guidelines. CODIS SOP (LAB-11). Texas Department of Public Safety Crime Laboratory.

CODIS Blood Kit Collection Form. CODIS SOP (LAB-CO-08). Texas Department of Public Safety Crime Laboratory.

4. Practice

4.1 Safety

A lab coat and gloves are required when handling samples. Eye protection and face masks are provided and may be used as well.

4.2 Equipment:

STaCS computer
Label printer
Blood tube rack (BTR)
CODIS barcode labels (2)
Letter opener
Scissors
Sharpie marker
Large trash can
Large trash bags
Biohazard container
Stapler

4.3 Observed Performance
Trainee will observe trainer opening a set of 72 blood collection kits including:

1. Printing CODIS barcode labels
2. Preparing blood tube racks for storage
3. Processing blood kits
   a) Checking for appropriate seal
   b) Checking contents of kit
   c) Determining whether a kit is accepted/rejected
      i. Blood tube labeled appropriately
      ii. Blood collection tube has at least 0.5 cm of blood
      iii. Readable thumbprints on DNA Database Card
      iv. Blood tube information matches DNA Database Card
   d) Placing barcode label on DNA Database Card and blood tube
4. Storing blood tubes
5. Scanning/saving court orders and other additional paperwork submitted with the collection kit

4.4 Supervised Performance
Under the supervision of the trainer, trainee will open a set of 72 blood collection kits (at a minimum) including all of the tasks listed in the supervised exercises.

5 Assessment
5.1 Competency and Qualifying Examination
Competency is not required for this module. The examination will consist of the supervised exercises described above.

Successful completion of this module is determined by the trainer and is a prerequisite for remaining CODIS technician modules.
**Preparer**

*Alyssa Shaffer*  
CODIS Advisory Board Chair  
Date: 07/22/2016

**Concurrence**

*Katherine G. Sanchez*  
Quality Assurance  
Date: 07/22/2016

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BUCCAL SAMPLE COLLECTION AND HANDLING

Duration 2 to 4 days
Purpose The trainee will learn how to properly receive and evaluate buccal samples for acceptance into the CODIS laboratory
Prerequisite GLT-TM-FUN-02 Safety, CO-TM-02 Introduction to CODIS / History of CODIS Program

1 Scope
All CODIS samples should be collected in accordance with the CODIS DNA Procedural Guidelines (LAB-11) and subjects shall be collected in accordance with State laws. This module presents the minimum standards for accepting samples in the CODIS Laboratory.

2 Objectives
2.1 Theoretical
Following the completion of training, the trainee will be able to:
1. List the information that is recorded on the buccal DNA Database Card during collection
2. Describe the reasons for rejecting a buccal sample and how to document the reject
3. List the information collected when taking orders for buccal collection kits

2.2 Practical
Following the completion of training, the trainee will be able to:
1. Print CODIS barcode labels using STaCS
2. Prepare labeled buccal sample boxes for storage
3. Process and screen buccal kits for acceptance
4. Properly package and ship buccal kit orders
5. Scan/save court orders/paperwork submitted with buccal kit

3 Training Outline
3.1 Lesson Plan
A. Buccal Receiving and Storage
   1. Printing CODIS barcode labels
   2. Preparing buccal storage boxes
   3. Processing Buccal Kits
      a) Checking for appropriate seal
      b) Checking contents of kit
      c) Determining whether a kit is accepted/rejected
         i. Buccal swab storage envelope is labeled appropriately
ii. Buccal swab storage envelope contains two swabs
iii. Readable thumbprints on DNA Database Card
iv. Information on buccal swab storage envelope matches with DNA Database Card
v. Placing barcode label on DNA Database Card and buccal swab storage envelope

4. Storing buccal samples
5. Scanning/saving court orders and other additional paperwork submitted with the collection kit

B. Processing buccal kit orders
1. Receiving kit order list from CODIS Liaison
2. Preparing packing slip
3. Preparing appropriate mailing label
4. Packing the appropriate items into a shipping box
5. Sealing, affixing labels, and placing box(es) for mail pick-up
6. Initialing and dating kit order list and returning to CODIS Liaison

3.2 Required Readings

Chapter 4: Sample Collection, Storage, and Characterization

Sample Collection and Handling (CO-02-01, Sections 3-5). CODIS SOP. Texas Department of Public Safety Crime Laboratory.

CODIS DNA Procedural Guidelines. CODIS SOP (LAB-11). Texas Department of Public Safety Crime Laboratory.

CODIS Buccal Swab Collection Kit Order Form (LAB-CO-08). Texas Department of Public Safety Crime Laboratory.

4 Practice

4.1 Safety

A lab coat and gloves are required when handling samples. Eye protection and face masks are provided and may be used as well.

4.2 Equipment

STaCS computer
Label printer
CODIS number labels (2)
Letter opener
Scissors
Sharpie marker
Large trash can
Large trash bags
Biohazard container
Stapler
Flash light
Buccal storage boxes
Court Order stamp

4.3 Observed Performance

Trainee will observe trainer setting up and opening a set of 72 buccal kits including:

1. Printing CODIS barcode labels
2. Preparing buccal boxes for storage
3. Processing buccal kits
   a) Checking for appropriate seal
   b) Checking contents of kit
   c) Determining whether a kit is accepted/rejected
      i. Buccal swab storage envelope labeled appropriately
      ii. Buccal swab storage envelope contains two buccal swabs
      iii. Readable thumbprints on DNA Database Card
      iv. Information on buccal swab storage envelope matches DNA Database Card
   d) Placing barcode label on DNA Database Card and buccal swab storage envelope
4. Storing buccal samples
5. Scanning/saving court orders and other additional paperwork submitted with the collection kit

4.4 Supervised Performance

Under the supervision of the trainer, trainee will open a set of 72 buccal collection kits (at a minimum) including all of the tasks listed in the supervised exercises.

5 Assessment

5.1 Competency and Qualifying Examination

Competency is not required for this module. The examination will consist of the supervised exercises described above.

Successful completion of this module is determined by the trainer and is a prerequisite for remaining CODIS technician modules.
Preparer

Alyssandra Shaffer
CODIS Advisory Board Chair
Date: 07/22/2016

Concurrence

Katherine G. Sanchez
Quality Assurance
Date: 07/22/2016

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DATA ENTRY

Duration 2 to 4 days

Purpose The trainee will learn which information is required for STaCS Data Entry Submission as well as Redraws/Rejects, and how/why cards are transported to AFIS for print verification.

Prerequisites CO-TM-CT-01 Blood Sample Collection and Handling, CO-TM-CT-02 Buccal Sample Collection and Handling

1 Scope

Samples meeting the qualifying criteria for sample receiving will be entered into the STaCS Data Entry module. Rejected samples (those not meeting the qualifications) or samples requiring redraws are entered into Data Entry module as rejects which are not put into processing.

2 Objectives

2.1 Practical

Following the completion of training, the trainee will be able to:

1. Enter information from DNA Database Cards into STaCS
2. Enter rejects/redraws into STaCS

3 Training Outline

3.1 Lesson Plan

A. Submission Information (qualifying samples)

1. Barcode Labels
   a) CODIS number
   b) Storage Unit

2. Required Fields (highlighted)
   a) Sample Nature (Blood vs. Buccal)
   b) Last Name – No hyphens or suffixes
   c) SID number
   d) Contributor Type

3. Fields that carryover to the next record
   a) Gender
   b) Race
   c) Sample Nature
   d) Contributor Type

4. Blood vs. Buccal
   a) Rack Identifier
b) Rack Position

c) Contributor Type

5. Agency Types
   a) Community Supervision and Correction Departments (CSCD) and alternate names
   b) Juvenile Probation
   c) Police Departments
   d) Sheriff’s Office
   e) Texas Department of Criminal Justice (TDCJ) unit
   f) Texas Department of Criminal Justice – parole (TDCJ-parole)
   g) Unknown/PD/SO/CSCD

6. Problem Kits
   a) Reasons for rejection

B. Redraws/Rejects
   1. Computerized Criminal History (CCH)
      a) Confirm/Verify Information from the data card
      b) Use CCH to fill out Reject information
      c) If not in CCH, use data card to fill out Reject information
   2. Required Fields (highlighted)
      a) Last Name – No hyphens or suffixes
      b) SID number
      c) Sample Nature
      d) Contributor Type
   3. Reasons for rejection

C. Card Storage locations
   1. Data Entry completion
   2. Reject/Redraw designated location

3.2 Required Readings
Sample Collection and Handling (CO-02-01, Section 6). CODIS SOP. Texas DPS Crime Laboratory

4 Practice

4.1 Equipment
STaCS computer
DNA database cards
CCH access
Barcode scanner

Agencies list

4.2 Observed Performance

Trainee will observe trainer enter information from a set of 72 DNA Database Cards including:

1. Starting the STaCS software and entering DNA Database Card information into STaCS
2. Ensuring Data Entry record and DNA Database Card match before saving
3. Entering Reject/Redraw information into STaCS
4. Verifying all information is correct before saving a Reject/Redraw

4.3 Supervised Performance

Under supervision of the trainer, trainee will enter information from a set of 72 DNA Database Cards (at a minimum) including all the tasks listed in the supervised exercises.

5 Assessment

5.1 Competency and Qualifying Examination

Competency is not required for this module. The examination will consist of the supervised exercises described above.

Successful completion of this module is determined by the trainer and is a prerequisite for remaining CODIS technician modules.
Preparer

Alyssandra Shaffer
CODIS Advisory Board Chair

Date: 07/22/2016

Concurrence

Katherine G. Sanchez
Quality Assurance

Date: 07/22/2016

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**AFIS VERIFICATION**

**Duration** 2 to 4 days

**Purpose** The trainee will learn how to update STaCS to reflect which cards have been accepted by AFIS through print verification.

**Prerequisite** CO-TM-CT-03 Data Entry

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1 **Scope**

All non-rejected submissions received in CODIS will be sent to AFIS for verification. Once the DNA Database Cards have returned from AFIS, personal information and sample status for each sample will be updated in STaCS and the sample will be queued for processing if acceptable. Duplicate samples and rejected samples will not be processed.

2 **Objectives**

2.1 **Theoretical**

Following the completion of training, the trainee will be able to:

1. List reasons why AFIS would reject a sample
2. Explain the difference between Redraw/Reject and a Problem Kit in STaCS
3. Explain the importance of sorting out duplicate samples
4. Explain the storage protocol of both acceptable and rejected cards
5. Describe how a duplicate check is activated in STaCS

2.2 **Practical**

Following the completion of training, the trainee will be able to:

1. Identify acceptable, rejected, duplicate, problem, and redraw samples
2. Create an AFIS Send File
3. Update STaCS database accordingly
4. Store cards in the appropriate location
5. Navigate within STaCS to update information after print verification

3 **Training Outline**

3.1 **Lesson Plan**

A. AFIS Send worklist
   1. Generate an AFIS Send file
   2. File transfer and manual upload
   3. Send the DNA Database Cards to AFIS for verification

B. Receive cards from AFIS once verified

C. AFIS Verification Worklist
   1. Login and start AFIS Verification module in STaCS
2. Transfer submissions from AFIS Verification list to AFIS Verification Personal list

3. Edit existing information in STaCs using AFIS summary sheet or CCH sheet

4. Correct Problem kit and Redraw fields using AFIS verification (when applicable) Sort out rejected submissions from AFIS (when applicable)
   a) Send to Problem Kit worklist or Redraw Management worklist
   b) File card with CODIS Liaison

5. For buccal samples, change the “Contributor Type” from “Arrestee” to “Convicted” (when applicable)

6. Duplicate Check performed by STaCs once information is saved
   a) Submission Match (Duplicate)
   b) Potential Submission Match (Potential Duplicate)
   c) No Match (Original Submission)
   d) BOLO

7. Submission status is updated appropriately in STaCS

D. Storage of verified cards

3.2 Required Readings
Sample Collection and Handling (CO-02-01, Sections 7 and 8). CODIS SOP. Texas Department of Public Safety Crime Laboratory.

4 Practice

4.1 Equipment
STaCS database computer
DNA Database Cards

4.2 Observed Performance
Trainee will observe trainer verify a stack of 100 DNA Database Cards including:

1. Navigating through the STaCS software
2. Creating an AFIS Send file and delivering DNA Database Cards for AFIS verification
3. Selecting samples to move from the AFIS Verification list to AFIS Verification Personal list
4. Making necessary amendments to the print verification information
5. Sorting through acceptable/rejected samples, Problem Kit and Redraw lists and performing the Duplicate Check
6. Storing DNA Database Cards after print verification

4.3 Supervised Performance
Under the supervision of the trainer, trainee will verify a stack of 100 DNA Database Cards (at a minimum) including navigating through the STaCS software in order to perform the aforementioned Supervised Exercises as well as storing the DNA Database Cards.

5 Assessment

5.1 Competency and Qualifying Examination

Competency is not required for this module. The examination will consist of the supervised exercise described above.

Successful completion of this module is determined by the trainer and is a prerequisite for remaining DNA technician modules.
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SAMPLE PREPARATION AND STORAGE

Duration 5 to 10 days
Purpose The trainee will learn how to properly prepare samples for processing and archiving.
Prerequisite CO-TM-CT-04 AFIS Verification

1 Scope
CODIS samples are typically processed in large groups. Accurate labeling and placement of samples is necessary to preserve sample identity throughout processing.

2 Objectives
2.1 Theoretical
Following the completion of training, the trainee will be able to:
1. List the precautionary measures taken when handling biohazardous material
2. Explain the importance of shaking blood tubes prior to blood spotting

2.2 Practical
Following the completion of training, the trainee will be able to:
1. Prepare samples for a blood spotting run
2. Prepare buccal swabs for processing
3. Utilize STaCS to transfer buccal samples from temporary storage into permanent storage
4. Properly store archive samples

3 Training Outline
3.1 Lesson Plan
A. Preparing samples for a blood spotting run
1. Setting up blood tubes on Tecan racks
   a) Pulling samples from blood tube racks (BTR)
   b) Placing samples in the appropriate order and position on Tecan rack
2. Preparing Archive cards
   a) Labeling stain cards
   b) Labeling envelopes
3. Blood tube opening
   a) Proper shaking techniques
   b) Uncapping blood tubes
   c) Bubble removal
4. Recapping and blood tube rack (BTR)
d) Recapping tubes  
e) Returning blood tubes to blood storage racks

5. Archive Storage  
a) Stuffing stain cards into labelled envelopes  
b) Sealing envelopes  
c) Storing sealed stain cards in archive boxes

B. Preparing buccal samples for processing  
1. Pulling samples from storage  
a) Pulling envelopes from storage location  
b) Placing envelopes in appropriate order  
c) Transferring samples from temporary storage to permanent storage in STaCS  

2. Storing buccal swab envelopes

3.2 Required Readings

Sample Processing Records. CODIS SOP (CO-01-06). Texas Department of Public Safety Crime Laboratory.

Blood Sample Preparation and Storage. CODIS SOP (CO-02-04). Texas Department of Public Safety Crime Laboratory.

Buccal Sample Preparation and Storage. CODIS SOP (CO-02-04B). Texas Department of Public Safety Crime Laboratory.

4 Practice

4.1 Safety

A lab coat and gloves are required when handling samples. Eye protection and face masks are provided and may be used as well. Extra precaution should be taken to avoid contact with the aerosol spray of blood droplets when removing blood tube tops.

4.2 Equipment

Blood tube racks (BTR)  
Tecan racks  
Blood Spotting Sample Selection / LBV sheets  
Biohazard bags  
Cotton squares  
Rubber stopper lids  
Barcoding software / computer  
Archive cards  
Blood / buccal envelopes  
Archive storage boxes
4.3 Observed Performance

A. Trainee will observe the trainer prepare samples for a blood spotting run including:
   1. Labeling archive cards and envelopes
   2. Pulling blood tubes from the blood tube racks and placing them into the proper positions on the Tecan racks using the sample selection sheets
   3. Shaking and removing blood tube caps and re-capping after blood spotting
   4. Returning blood tubes to the blood tube racks.
   5. Stuffing archive cards into their proper storage envelope, sealing, and placing in archive storage box

B. Trainee will observe the trainer prepare buccal swabs for processing including
   1. Pulling samples from the sample selection sheet
   2. Transferring samples from temporary to permanent storage in STaCS
   3. Placing buccal swab storage envelopes into archive storage boxes

4.4 Supervised Performance

1. Under the supervision of the trainer, the trainee will prepare samples for a blood spotting run, including all of the tasks listed in the supervised exercises.

2. Under the supervision of the trainer, the trainee will prepare buccal swabs for processing, including all of the tasks listed in the supervised exercises.

5 Assessment

5.1 Competency and Qualifying Examination

Competency is not required for this module. The examination will consist of the supervised exercises described above.

Successful completion of this module is determined by the trainer and is a prerequisite for remaining DNA technician modules.
Training Manual
CODIS
Subject: Sample Preparation and Storage

Preparer

Alyssandra Shaffer
CODIS Advisory Board Chair

Date: 07/22/2016

Concurrence

Katherine G. Sanchez
Quality Assurance

Date: 07/22/2016

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BLOOD TUBE DESTRUCTION

Duration 3 to 5 days
Purpose The trainee will learn the process for blood tube destruction.
Prerequisite CO-TM-CT-05 Sample Preparation and Storage

1 Scope
Blood samples should not be destroyed until a suitable profile has been developed. Once a sample has been uploaded to CODIS and has been Administratively Reviewed, the original liquid blood tube will be destroyed in order to make room for incoming samples. Tubes to be destroyed in blood tube racks (BTR) are removed and disposed. Remaining blood tubes are consolidated into racks and are stored. All biohazardous material must be properly disposed.

2 Objectives
2.1 Theoretical
Following the completion of training, the trainee will:
   1. Recognize which blood samples should be destroyed and which should be kept
   2. Be familiar with proper biohazard handling and disposal procedures

2.2 Practical
Following the completion of training the trainee will be able to:
   1. Pull appropriate Blood Tube Racks (BTR) for destruction
   2. Place appropriate tubes into biohazard bags for destruction
   3. Save and store samples not on disposal list

3 Training Outline
3.1 Lesson Plan
A. Blood Tube Disposal
   1. Sample Disposal module in STaCS
      a) Locating blood tubes
      b) Scanning blood tubes
      c) Verifying the List Count decreases by the number of tubes scanned
   2. Storage Subsystem module in STaCS
      a) View Contents
         i. Long Term Storage location
         ii. Noting Item Count number
      b) Store Items
         i. Scanning Long Term Storage location
ii. Scanning blood tubes

c) Item Count Update

i. View Contents

ii. Verifying Item Count was updated

3. Biohazard Disposal

a) Container and bags

b) Emptying racks of tubes

c) Securing bag

d) Moving to appropriate location

B. Samples not on Sample Disposal

1. Error with tubes not ready to be disposed

2. Clearing Error

3. Setting aside tube to put in Awaiting Disposal

4. Awaiting Disposal Racks

   a) Storage Subsystem module in STaCS

   b) Scanning Awaiting Disposal Rack barcode

   c) Scanning tubes

   d) Placing tubes in order scanned into rack

C. Washing racks

1. Removing barcodes

2. Cleaning with bleach solution

3. Air-drying racks

3.2 Required Reading

Sample Destruction (CO-02-02, Sections 1 & 2.4). CODIS SOP. Texas Department of Public Safety Crime Laboratory.

4 Practice

4.1 Safety

A lab coat and gloves are required when handling samples. Eye protection and face masks are provided and may be used as well.

4.2 Equipment

STaCS computer

Blood Tube Racks (BTR)

Biohazard bags
4.3 Observed Performance
Trainee will observe trainer disposing of a rack of blood tubes including:

1. Navigating the appropriate modules in STaCS
2. Properly disposing blood tubes
3. Consolidating and storing remaining blood tubes
4. Washing the emptied racks so they can be reused

4.4 Supervised Performance
Under the supervision of the trainer, trainee will dispose a rack of blood tubes (at a minimum) including all of the tasks listed in the Supervised Exercises.

5 Assessment

5.1 Competency and Qualifying Examination
Competency is not required for this module. The examination will consist of the supervised exercises described above.

Successful completion of this module is determined by the trainer.
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INTRODUCTION TO FORENSIC DNA ANALYSIS

Duration 2 to 4 days

Purpose Enable a trainee to communicate with appropriate forensic DNA terms. Educate a trainee on the earlier procedures and advances in forensic DNA typing.

Prerequisite None

1 Scope

Studying the history of human identification testing will provide the trainee with a foundation of concepts and methodologies used in forensic DNA laboratories. By studying the development of DNA analysis in forensic science, the analyst will understand the methods and theory behind the work being performed in the CODIS laboratory.

2 Objectives

2.1 Theoretical

Following the completion of training the trainee will:

1. Describe the two main purposes of DNA
2. List the three components of a nucleotide unit and the four nucleobases
3. Describe why hybridization is a fundamental property of DNA
4. Define denaturation and renaturation
5. Define gene, allele, locus, exon, intron, and polymorphic
6. Define diploid, haploid, homozygous, heterozygous, and genotype
7. Describe the two primary forms of measuring DNA variation
8. Describe the law of segregation and the law independent assortment
9. Describe the significance of Hardy-Weinberg equilibrium
10. Describe the RFLP process
11. List some of the limitations of RFLP
12. List and describe some of the early PCR-based protocols
13. Define short tandem repeat (STR) and STR multiplex system
14. List both advantages and disadvantages for using PCR based methods
15. Describe the steps involved in processing forensic DNA samples
16. List and describe some of the early DNA detection methods
17. List some methods/guidelines that are followed during sample collection to ensure sample preservation
18. Describe some of the methods used to collect reference samples
19. Describe optimal storage conditions for preserving DNA

2.2 Practical

None
3 Training Outline

3.1 Lesson Plan

A. Basics of DNA Biology and Genetics (Butler)

1. Basic DNA Principles
   a) DNA structures and definitions
   b) Base pairing and hybridization
   c) Chromosomes, genes, and DNA markers
   d) Nomenclature for DNA markers

2. Population Variation
   a) Types of DNA polymorphisms
   b) Genetic variability
   c) Recombination
   d) Methods for measuring DNA variation

3. Introductory Genetic Principles
   a) Laws of Mendelian genetics
   b) Hardy-Weinberg equilibrium and linkage equilibrium

B. Historical Methods (Butler)

1. A Comparison of DNA Typing Methods
2. The Pre-DNA Years (1900-1985)
   a) Blood group testing
   b) Forensic protein profiling
4. RFLP-Based DNA Testing
   a) Multi-locus VNTR probes
   b) Single-locus VNTR probes
   c) Restriction enzyme differences between laboratories
   d) Speed and sensitivity
   e) Quality concerns and ‘the DNA wars’
5. Early PCR-Based DNA Testing
   a) HLA DQ alpha/DQA1
   b) PolyMarker (PM + DQA1)
   c) D1S80: a PCR-amplified VNTR
   d) Short tandem repeats (STRs)
a) Fluorescent detection STR kits

7. Advantages and Limitations of DNA Typing Methods

C. Sample Collection, Storage, and Characterization (Butler)

1. Steps in DNA testing process

2. Sample Collection
   a) DNA sample sources
   b) Biological evidence at crime scenes
   c) Evidence collection and preservation
   d) Collection of reference DNA samples

3. Sample Storage and Transport of DNA Evidence

3.2 Required Readings


4 Practice

None

5 Assessment

5.1 Competency and Qualifying Examination

The trainer will administer a written examination. Incorrect responses will be reviewed and/or remediated with the trainee.

Successful completion of this module is determined by the trainer.
Preparer

Gary Molina  
CODIS Program Manager  
Date: 07/22/2016

Concurrence

Katherine G. Sanchez  
Quality Assurance  
Date: 07/22/2016

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EZ1 ADVANCED XL EXTRACTION

Duration 3 to 5 days
Purpose Trainee will recover and isolate DNA using the Qiagen EZ1 Advanced XL
Prerequisite CO-TM-CA-01

1 Scope

Several DNA extraction methods are used in the forensic community. In the past, many of these methods were taxing of both time and labor and some involved the use of hazardous chemicals as well. With the necessity of high throughput assays, magnetic separation has become an integral tool for forensic laboratories with highly automated and cost effective systems.

Silica-coated magnetic particles are introduced into a lysate resulting in DNA molecules binding to the silica in the presence of chaotropic salts. A magnet is then used to separate the bound molecules from the lysate into a series of washes and finally into an elution solution, yielding a purified DNA extract. The amount and concentration of the yielded product can be influenced by varying the amount of magnetic particles and the volume of elution solution used respectively.

2 Objectives

2.1 Theoretical

Following the completion of training, the trainee will:

1. Describe the purpose of DNA extraction.
2. Describe, compare and contrast various methods of DNA extractions (organic, FTA, solid-phase).
3. Describe the purpose of a chaotropic salt.
4. Describe the components of the EZ1 Advanced XL instrument and the reagents used in the EZ1 DNA Investigator Kit.
5. Explain the various sample types and controls associated with an EZ1 run.
6. Describe the instrument decontamination process.
7. Explain measures used to limit contamination.
8. Describe the Plate Create process and EZ1 Processing modules used in STaCS.

2.2 Practical

Following the completion of training, the trainee will be able to:

1. Prepare the necessary reagents used in the EZ1 Advanced XL extraction protocol.
2. Perform the necessary precautions to prevent contamination during the extraction process.
3. In STaCS, create a plate in the Plate Create module and process it in the EZ1 Processing module.
4. Isolate DNA from blood archive cards or buccal swabs using the EZ1 Advanced XL extraction protocol.

5. Perform post-process decontamination and workspace clean up.

3 Training Outline

3.1 Lesson Plan

A. Discuss contamination and steps taken to avoid it
   1. Maintaining sample integrity
   2. Types of contamination
      a) Sample-to-sample
      b) Extraneous
   3. Precautions
      a) Decontaminate workspace before and after processing
         i. Appropriate cleaning solutions
         ii. Avoid using bleach
      b) Clean cutting and punching tools between samples
      c) Properly seal the samples after use
      d) Appropriate Personal Protective Equipment (PPE)
         i. Room specific lab coats
         ii. Gloves
         iii. Face mask

B. Qiagen EZ1 Advanced XL
   1. Identifying parts
      a) Exterior
         i. Door
         ii. Control panel
         iii. Card slot
         iv. Status LEDs
      b) Interior
         i. Pipettor head
         ii. Cartridge rack
         iii. Tube/tip rack
         iv. Magnets

C. Qiagen EZ1 DNA Investigator Kit
   1. Components
a) Buffer G2
   i. Water dilution
b) Proteinase K
c) Reagent cartridges

2. Receiving in STaCS (Qiagen Kit Receiving & Qiagen Container Breakdown)
   a) Receiving
   b) Container breakdown

D. Plate Create module in STaCS
   1. Plate Type
      a) EZ1 plate
   2. Protocol
      a) Not Defined
   3. Sample Nature
      a) Leave menu blank

E. EZ1 Processing module in STaCS
   1. Available Plates
   2. Consumables
   3. Sets
      a) Add Set
   4. Scanned Sets

F. EZ1 sample setup and processing with STaCS
   1. Sample types
      a) Blood cards
         i. FTA cards
         ii. Non-FTA cards
      b) Buccal swabs
      c) Long term storage (LTS) plates
   2. Isolate DNA from blood archive cards
   3. Isolate DNA from buccal swab cutting
   4. Isolate DNA from LTS plate (lecture only)

3.2 Required Readings


4 Practice

4.1 Safety

Wear lab coat and gloves when working in the laboratory. Face masks may be used as appropriate. Avoid using bleach to decontaminate work areas due to the guanidinium compounds present in the EZ1 DNA Investigator Kit.

4.2 Equipment

STaCS computer
Qiagen EZ1 Advanced XL
Qiagen EZ1 DNA Investigator Kit
Single hole puncher
Heat block
Scissors
Pipettes, adjustable
Pipette tips
Tweezers
Ethanol
Kimwipes
Blank FTA card

4.3 Quality Control

1. STaCS modules for tracking and processing records
2. Reagent blanks for each set of extractions

4.4 Observed Performance

Trainee will observe trainer extract a set of samples on the EZ1 Advanced XL including:

1. Creating a plate in STaCS
2. Preparing samples for extraction
   a) Reagent preparation (if needed)
   b) Creating sample barcodes
   c) Incubation
d) Instrument preparation
   i. Cartridges
   ii. Elution tubes
   iii. Tips and tip holders
   iv. Selecting appropriate elution protocol

3. Utilizing EZ1 Processing module in STaCS
4. Post-process decontamination

4.5 Supervised Performance

Under the supervision of the trainer, trainee will extract a set of samples on the EZ1 Advanced XL, including all of the tasks listed in the observational exercises. These extractions will be stored and used for the amplification exercises in CO-TM-CA-03.

The exercises will be utilizing the STaCS test server.

5 Assessment

5.1 Competency and Qualifying Examination

The trainer will administer a written examination. Incorrect responses will be reviewed and/or remediated with the trainer.

The trainee will independently extract a minimum of 5 samples on the EZ1 Advanced XL utilizing the STaCS test server. These extractions will be stored and used for the amplification competency set in CO-TM-CA-03.

Successful completion of this module is determined by the trainer.
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AMPLIFICATION

Duration 1 to 2 weeks
Purpose Educate trainee about the polymerase chain reaction and short tandem repeats as well as the manual and automated DNA amplification protocols using validated amplification kits.
Prerequisite CO-TM-CA-02

1 Scope
The discovery of the polymerase chain reaction has paved the way for many other important tools and technologies in the forensic science community. The polymerase chain reaction (PCR) allows for the replication of specific regions of DNA in order to yield millions of copies. Short tandem repeats (STRs) are small, repeatable fragments of DNA that are highly variable among individuals. Using PCR to amplify multiple STR markers simultaneously allows for more rapid analysis and greater discrimination. Coupling PCR and multiplex STR technology with automation has yielded greater accuracy and higher throughput in the CODIS laboratory.

2 Objectives
2.1 Theoretical
Following the completion of training the trainee will be able to:

A. Define polymerase chain reaction (PCR) and describe the steps involved
B. Describe the different components in an amplification mix as well as the purpose of each component
C. Describe the importance of Taq polymerase
D. Describe “hot-start” PCR
E. Define short tandem repeats (STR) and discuss their importance in forensic science
F. Define multiplex PCR
G. List and describe the amplification kits currently used in the lab
H. Describe the significance of using multiple kits in the lab
I. Define the CODIS core STR loci
J. Describe the appropriate controls used in the amplification of DNA samples and their purposes
K. Describe the relationship between the reagent blank and samples
L. Define PCR template ranges as stated in the CODIS SOP
M. Describe possible causes of PCR inhibition and how to remove PCR inhibitors
N. Define the amplification thermal cycling parameters for each kit
O. Describe the differences between direct amplification and standard amplification

2.2 Practical
Following the completion of training the trainee will be able to:
A. Create an amplification plate in STaCS Master Mix Addition module.

B. Prepare the amplification mix and perform either the manual or automated robotic amplification set-up of samples.

C. Complete the STaCS Master Mix Addition and Amplification modules as well as the appropriate documentation for quality control.

3 Training Outline

3.1 Lesson Plan

A. Discuss contamination and steps taken to avoid it

1. Maintaining sample integrity
2. Types of contamination
   a) Sample-to-sample
   b) Extraneous
3. Technological advances
   a) Direct kits
   b) Increased kit sensitivity
4. Precautions
   a) Separating pre- and post-PCR sample processing
   b) Appropriate Personal Protective Equipment (PPE)
      i. Room specific lab coats
      ii. Gloves
      iii. Face masks
   c) Decontaminating work surfaces
      i. Bleach
   d) Equipment
      i. Laminar flow hood
      ii. Aerosol-barrier tips
   e) Staff profiles
   f) Contamination log
   g) Limiting consumable and reagent contamination
      i. STaCS tracking
      ii. Reagent aliquots

B. Discuss how STaCS workflows lead into amplification

1. Master Mix Addition module
   a) EZ1/QIAsymphony
   b) Buccal
2. Plate Preparation module followed by Punch module
   a) Blood

C. Current kits used
   1. Investigator 24plex GO! kit
      a) Components
      b) Volumes used
         i. Buccal
         ii. Blood
      c) Thermocycler parameters
   2. Identifiler Direct
      a) Components
      b) Volumes used
         i. Buccal
         ii. Blood
      c) Thermocycler parameters
   3. Identifiler
      a) Components
      b) Volumes used
      c) Thermocycler parameters
   4. Yfiler
      a) Components
      b) Volumes used
      c) Thermocycler parameters

D. Amplification plate set-up using STaCS
   1. Manual or automated process
      a) Buccal plate
      b) Blood plate
      c) EZ1/QIAsymphony plate
      d) Rework plate
   2. Supporting plate documentation
      a) PickSample sheet
      b) Plate layout
   3. Master Mix Addition module
      a) Create Plate
i. Plate Layout

ii. Plate Source

iii. Amplification Plate Analytical Process

iv. Plate Create Worklist

v. Allocate samples to plate

vi. Proper barcode placement

b) Get Scenario

i. Manual

ii. Tecan EVOware

c) Process

d) “Record Activity Completion Result” window

E. QA/QC measures

1. STaCS
   a) Controlling reagents
      i. Workflow specific
      ii. Expiration dates

2. Quality control runs for amplification kits

3. Amplification Controls
   a) Negative Control
      i. Directly reflecting the most sensitive volume of the sample(s) used
      ii. Rework scenarios

   b) Amplification Blank
      i. Detects contamination in amplification reagents
      ii. Workflow differences

   c) Positive Control
      i. Amplification indicator
      ii. Software check

F. Sample preparation for amplification

1. Bench top decontamination (optional)

2. Master Mix preparation and aliquotting
   a) Manual process
   b) Automated process

3. Sample addition
   a) Manual process
4. Controls
   a) Negative Control
   b) Amplification Blank
   c) Positive Control

5. Plate transport preparation
   a) Clear seal
   b) Centrifuge

6. Bench top decontamination (required)

7. Replenishing consumables
   a) Restocking consumables
   b) STaCS Storage Subsystem

G. Amplification module
   a) Thermocycler – PCR plate assignment
   b) Thermocycler program for specific kit

3.2 Required Readings


Qiagen. Investigator 24plex GO! Handbook.

CO-03-12 Investigator 24plex GO! Amplification. CODIS SOP. Texas DPS Crime Laboratory.


4 Practice

4.1 Safety

Wear lab coat and gloves when working in the laboratory. Face masks may be used as appropriate.

4.2 Equipment, Materials, and Reagents

STaCS computer
Thermocycler
Centrifuge
Microcentrifuge tubes, 1.5 mL
Vortex
96-well amplification plate
Amplification cover
Appropriate plate seal
Pipettes, adjustable
Pipette tips
Investigator 24plex GO! PCR Amplification Kit
Investigator STR GO! Punch Buffer
AmpFISTR Identifiler PCR Amplification Kit
AmpFISTR Yfiler PCR Amplification Kit
AmpFISTR Identifiler Direct PCR Amplification Kit
Prep-n-Go Buffer
TE buffer
Tecan Freedom EVO 100 (instrument, computer, and appropriate software)
TYPE I water

4.1 Quality Control
1. STaCS modules for tracking and processing records
2. Amplification controls added to each amplification plate
3. New amplification kit lots are quality control tested prior to use

### 4.2 Observed Performance

The trainee will observe the trainer set-up and amplify a set of known samples with Investigator 24plex GO! including:

1. Creating an amplification plate using the Master Mix Addition module in STaCS
2. Amplification plate set-up
   a) Generate PickSample or plate layout sheet (if needed)
   b) Master Mix preparation and aliquotting
      i. Manual scenario
      ii. Automated scenario
   c) Sample addition
      i. Manual scenario
      ii. Automated scenario
   d) Controls
      i. Negative Control
      ii. Amplification Blank
      iii. Positive Control
   e) Plate transport
3. Assigning plate to thermocycler using the Amplification module in STaCS
4. Post-process decontamination

Optional: The trainee will observe trainer set-up and amplify a set of known samples with Identifiler Direct, Identifiler, and/or Yfiler.

### 4.3 Supervised Performance

Under supervision, the trainee will manually set-up and amplify a set of known blood samples with Investigator 24plex GO! using the manual scenario, including all of the applicable tasks listed in the observational exercises.

Under supervision, the trainee will set-up and amplify a plate of known samples with Investigator 24plex GO! using the automated scenario, including all of the applicable tasks listed in the observational exercises.

Optional: Under supervision, the trainee will manually set-up and amplify a set of known samples with Identifiler and Yfiler using the manual scenario, including all of the applicable tasks listed in the observational exercises.

Optional: Under supervision, the trainee will set-up and amplify a plate of known samples with Identifiler Direct using the automated scenario, including all of the applicable tasks listed in the observational exercises.
The exercises will utilize the STaCS test server.

5 Assessment

5.1 Competency Set and Qualifying Examination

The trainee will independently amplify a set of known samples with Investigator 24plex GO! using the manual scenario in the STaCS test server. This plate will be stored and used for the capillary electrophoresis competency set in CO-TM-CA-04.

The trainee will independently amplify a plate of known samples with Investigator 24plex GO! using the automated scenario in the STaCS test server. This plate will be stored and used for the capillary electrophoresis competency set in CO-TM-CA-04.

Optional: The trainee will independently amplify a set of known samples with Identifiler and Yfiler using the manual scenario in the STaCS test server.

Optional: The trainee will independently amplify a plate of known samples with Identifiler Direct using the automated scenario in the STaCS test server.

The trainer will administer a written examination. Incorrect responses will be reviewed and/or remediated with the trainee.

Successful completion of this module is determined by the trainer.
## Revision History

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| 02        | 12/13/2011     | Major Revision – Sections 1, 2, and 3  
Advisory Board |
| 03        | 07/29/2016     | Minor Revision – Sections  
Formerly DRN: CO-TM-DNA-02 |
| 04        | 02/16/2018     | Major Revision – Sections 2, 3 and 4 |
CAPILLARY ELECTROPHORESIS (CE)

Duration 2 to 4 weeks

Purpose Educate trainee on the proper use of the genetic analyzers, how to troubleshoot problems with the instrument and make recommendations on fixing any encountered problems.

Prerequisite CO-TM-CA-03

1 Scope

Multiplex short tandem repeat (STR) markers can be amplified using fluorescent dye-labeled primers. The PCR products are then separated by size using capillary electrophoresis (CE). Genetic analyzers gather data by detecting signals from fluorescently labeled DNA fragments after separation.

Multicomponent analysis is the process that separates the different fluorescent dye colors into distinctive spectral components. Although each dye emits its maximum fluorescence at a different wavelength, there is some overlap in the emission spectra. The precise spectral overlap is measured by analyzing DNA fragments labeled with each of the dyes. These dye-labeled fragments are matrix standards.

Spectral files vary between instruments, virtual filter sets and run conditions on a single instrument. However, the spectral overlap between the dyes is reproducible under constant run conditions.

2 Objectives

2.1 Theoretical

Following the completion of training the trainee will be able to:

1. Compare and contrast different DNA separation methods
2. Define capillary electrophoresis (CE)
3. Label and describe the components of the various genetic analyzers
4. Describe how genetic analyzer platforms differ from one another
5. Describe the maintenance process and frequency for each platform
6. Describe the steps taken in troubleshooting a problem with the CE
7. Define multicomponent analysis
8. Define filter set
9. Define spectral and spatial calibrations and describe when each is needed
10. Describe capillary orientation of each of the array types
11. Describe the sample set-up needed for a CE run
12. Describe the STaCs workflows that are associated with CE

2.2 Practical

Following the completion of training the trainee will be able to:

1. Clean and maintain the genetic analyzer
2. Document the weekly maintenance in STaCs
3. Navigate through the data collection software
4. Navigate through the Electrophoresis Plate Prep and Post PCR modules in STaCs
5. Change an array from any of the various genetic analyzers and complete the appropriate documentation
6. Run and evaluate a spatial/spectral file and complete the appropriate documentation
7. Perform manual and automated plate set-up and capillary electrophoresis on previously analyzed samples. Complete the STaCs Electrophoresis Plate Prep and Post PCR modules
8. Complete the STaCs Electrophoresis Plate Prep and Post PCR modules
9. Troubleshoot problems with the genetic analyzer
10. Archive data and maintain the CE computer

3 Training Outline

3.1 Lesson Plan
The lesson plans will be covered for each appropriate genetic analyzer platform
A. Computer and instrument start up
B. Genetic analyzer
   1. Platforms
      a) 3130xl
      b) 3500xl
      c) 3730
   2. Parts of the instrument
      a) Laser
         i. Argon-ion (3130xl/3730)
         ii. Solid state (3500xl)
      b) Charge-coupled device (CCD)
      c) Autosampler
      d) Polymer delivery pump
      e) Oven
      f) Capillary array
      g) Detection cell
      h) In/Out stack tray (3730)
      i) Buffer heater
      j) Radio frequency identification (RFID) - 3500xl
C. Data collection software (3130/3130xl, 3730/3730xl)

1. Wizards
   a) *Install Array*
   b) *Change Polymer*
   c) *Replenish Polymer*
   d) *Bubble Remove*
   e) *Water Wash*
   f) *Instrument Shutdown*

2. Plate Manager
   a) *Create plates*
   b) *Import plates*
   c) *Edit plate layout and run parameters*

3. Module Manager
   a) *Run module types*
      i. *Regular*
      ii. *Spectral*
      iii. *Spatial*
   b) *Run module parameters*
      i. *Polymer type*
      ii. *Capillary length*
      iii. *Injection time*

4. Protocol Manager
   a) *Run modules*
   b) *Dye sets*

5. Spectral / Spatial calibrations
   a) *Multicomponent analysis*

6. Plate Records
   a) *Results group*
   b) *Instrument protocol*

7. Barcode / manual control
8. Run scheduler

D. Data collection software (3500/3500xl)

1. Common Operations tiles
   a) *Quick Start Run*
2. Dashboard Panel Tab
   a) Component Gauges
      i. Conditioner/Polymer
      ii. ABC (Anode Buffer Container)
      iii. CBC (Cathode Buffer Container)
      iv. Array
   b) Instrument Status Panel
      i. Oven pre-heat
   c) Consumables Information
   d) Calendar Reminders

3. Workflow Panel Tab
   a) Plate Set-up
   b) Run Instrument
   c) Review Results

4. Library Panel Tab
   a) Manage Plates
   b) Manage Assays
      i. Instrument protocols
      ii. Dye sets
      iii. Size standards
      iv. Size calling protocols
      v. QC protocols
      vi. HID Analysis protocols
   c) Manage File Name Conventions
   d) Manage Results Group

5. Maintenance Panel Tab
   a) Calibrate spatial
   b) Calibrate spectral
   c) Maintenance wizards
i. Install capillary array  
ii. Fill array with polymer  
iii. Remove bubbles  
iv. Replenish polymer  
v. Wash pump and channels  
vi. Change polymer type  
vii. Shutdown the instrument  
viii. Reactivate the instrument

E. Instrument maintenance and cleaning  
1. Reasons why  
2. Annual planned maintenance (PM)  
3. Weekly (3130xl, 3730) / Biweekly (3500xl) maintenance  
   a) Sequencer Configuration module (STaCS)  
   b) Water trap flush  
   c) Water wash wizard (data collection software)  
   d) Buffer dilution (3500xl has prepackaged buffer reservoirs)  
   e) Water/buffer reservoirs and septa (3130xl, 3730)  
   f) Array port flush (required on 3130xl)  
   g) Instrument Maintenance module (STaCS)  
4. Instrument shutdown  
5. Long-term capillary storage  
6. Maintenance log  
   a) Capillary changes  
   b) Spatial files  
   c) Spectral files  
   d) Instrument service  
7. Performance check  

F. Rebooting the instrument  
   a) Soft reboot - Resetting the instrument only  
      i. Reset instrument using reset button  
      ii. Reset instrument using On/Off button  
   b) Hard reboot – Computer and instrument reboot

G. Sample CE set-up (covered for all STaCS scenarios)  
   STaCS automatically assigns all TECAN scripts by scenario
1. Electrophoresis Plate Prep (EPP) module (STaCS)
   a) EPP Daughter Plate Creation
      i. Plate layout
      ii. Plate source
      iii. New plate sub-type
      iv. Allocating samples to plate
   b) Barcodes
      i. Orientation of plate barcodes
      ii. 3730 barcode reader
   c) Scenarios
      i. Manual set-up
      ii. Number of plates for manual set-up
      iii. Automated set-up
      iv. Kit
      v. Plate barcode
      vi. Reagent barcode
   d) Supporting plate documentation
      i. PickSample
      ii. Plate layout

2. Formamide/size standard master mix
   a) Setting up the appropriate ratio per sample
   b) Calculating the correct volume to prepare
   c) Dispensing master mix manually
   d) Setting master mix tube on TECAN deck for automated process

3. Samples/controls transfer
   a) Amplicon volume
   b) Manual transfer
      i. Single channel pipettor
      ii. Multichannel pipettor
   c) TECAN transfer
      i. Proper plate orientation on deck
      ii. Choosing the appropriate script (applicable outside of STaCS runs)
      iii. Closing script

4. Adding allelic ladder
a) Appropriate volume
b) Using PickSample or plate layout sheet

5. Record Activity Results Completion window (STaCS)

6. Centrifuge plate

7. Plate cartridges
   a) Proper plate placement
      i. 3130xl
      ii. 3730
      iii. 3500xl

8. Post PCR module (STaCS)
   a) Instrument/plate assignments
      i. Scanning barcodes
   b) Sample sheet creation
      i. Appropriate directory
   c) Import Sample sheet into data collection software
      i. Adding runs/editing parameters
   d) Start run in data collection software
   e) Start process in STaCS
   f) Evaluate data prior to Post PCR module completion
      i. Evaluate ladders and controls
      ii. Assign samples/controls for reinjection (if needed)
   g) Record Activity Completion Results window

H. Data transfer
   1. Run conditions in data folder
   2. Data folder with run conditions into appropriate folder in Macshare

I. Post run cleanup
   1. Delete sample sheet form Plate Manager queue
   2. Remove plates from autosampler/output stack
      a) Clean septa
      b) Discard plate

J. Troubleshooting
   1. STaCS error messages
      a) Wrong plate subtype
      b) Maintenance is needed on instrument
2. Identifying Problems with the Instrument
   a) Status light
   b) Error messages
   c) Bad data
      i. Poor resolution
      ii. Capillary issues
      iii. Excessive pull-up
      iv. Migration problems

3. Determining Causes of Problems
   a) Bubbles
   b) Leaks
   c) Arcing
   d) Dirty detection cell window
   e) Bad reagents
   f) Array
      i. Detection cell orientation
      ii. Silica lining deterioration

4. Determining Solutions to Problems
   a) Water flush
   b) Formamide flush
   c) Wizards
   d) Array replacement

3.2 Required Readings


CO-03-05 Capillary Electrophoresis, CODIS SOP. Texas DPS Crime Laboratory.

Applied Biosystems. 3130/3130xl Genetic Analyzers, Getting Started Guide.


Applied Biosystems. 3500/3500xL Genetic Analyzer User Guide.


4 Practice

4.1 Safety
Appropriate personal protective equipment (PPE) must be worn. Formamide is harmful if absorbed through the skin and is considered an irritant. Polymer is considered an irritant.

4.2 Equipment
Genetic Analyzers (Instrument, computer and appropriate software)
TECAN Freedom EVO 100 (Instrument, computer and appropriate software)
Capillary arrays
Conditioning reagent
Reservoirs and reservoir septa
Buffer (10x) w/ EDTA
Prepackaged anode/cathode buffer reservoirs
Polymer
Matrix standard kits
Internal size standards
Allelic ladders
Hi-Di formamide
96-well semi-skirted plates and plate septa
Plate cassette
Vortex
Centrifuge
Microcentrifuge tubes – 1.5 ml

4.3 Quality Control
1. STaCS modules for tracking and processing records
2. Appropriate amplification controls, in-lane size standard, and allelic ladder with each instrument run

4.4 Observed Performance
Trainee will observe the trainer perform maintenance on the 3130xl and 3500xl genetic analyzer platforms including:
1. Water trap flush
2. Water wash wizard
3. Buffer dilution if applicable
4. Water/buffer reservoirs
5. Array flush
6. Run spectral/spatial
7. **Instrument shut-down (short-term)**

Trainee will observe the trainer set-up and run a set of previously analyzed Investigator 24plex GO! samples on the genetic analyzer including:

1. Electrophoresis Plate Prep module (STaCS)
2. Preparing the master mix
   a) **Formamide**
   b) **Size standard**
3. Setting up the plate with the appropriate scenario
   a) **Automated (3500xl)**
   b) **Manual (3130xl)**
4. Samples/control transfer
5. Adding the allelic ladder
6. Centrifuge plate
7. **Post PCR module (STaCS)**
   a) **Instrument/plate assignment**
   b) **Sample sheet creation and import**
   c) **Post run examination of ladders and controls, troubleshooting, and re-injections if needed**
   d) **Module completion**
8. Data transfer
9. Post run cleanup

Optional: The trainee will observe the trainer set up and run a set of previously analyzed Identifiler, Identifiler Direct, and/or Yfiler samples on the genetic analyzer.

### 4.5 Supervised Performance

Under the supervision of the trainer, the trainee will perform maintenance on the 3130xl and 3500xl genetic analyzer platforms.

Optional: Under the supervision of the trainer, the trainee will change an array.

Under the supervision of the trainer, the trainee will use the manual scenario to set up and run a set of previously analyzed Investigator 24plex GO! samples on the 3130xl, including all of the applicable tasks listed in the Observational Exercises.

Under the supervision of the trainer, the trainee will use the automated scenario to set up and run a plate of previously analyzed Investigator 24plex GO! samples on the 3500xl, including all of the applicable tasks listed in the Observational Exercises.

Optional: Under the supervision of the trainer, the trainee will use the manual scenario to set up and run a set of previously analyzed Identifiler and Yfiler samples on the 3130xl, including all of the applicable tasks listed in the Observational Exercises.
Optional: Under the supervision of the trainer, the trainee will use the automated scenario to set up and run a plate of previously analyzed Identifiler Direct samples on the 3130xl, including all of the applicable tasks listed in the Observational Exercises.

The exercises will be utilizing the STaCS test server.

5 Assessment

5.1 Competency and Qualifying Examination

Using the extracted samples amplified with Investigator 24plex GO! from the previous assessment, the trainee will independently set-up and run the samples on the 3130xl using the manual scenario on the STaCS test server. The data generated will be used for the Data Interpretation competency in CO-TM-CA-05.

Using the plate of known samples amplified with Investigator 24plex GO! from the previous assessment, the trainee will independently set-up and run the samples on the 3500xl using the automated scenario on the STaCS test server. The data generated will be used for the Data Interpretation competency in CO-TM-CA-05.

Optional: Using the extracted samples amplified with Identifiler and Yfiler from the previous assessment, the trainee will independently set-up and run the samples on the 3130xl using the manual scenario on the STaCS test server.

Optional: Using the plate of known samples amplified with Identifiler Direct from the previous assessment, the trainee will independently set-up and run the samples on the 3130xl using the automated scenario on the STaCS test server.

The trainer will administer a written examination. Incorrect responses will be reviewed and/or remediated with the trainee.

Successful completion of this module is determined by the trainer.
# Revision History

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DATA INTERPRETATION

Duration 6 to 8 weeks

Purpose Educate trainee on the proper use of GeneMapper ID-X, how to analyze and interpret short tandem repeat (STR) data, how to troubleshoot problems with data, and how to review and assign rework points/reasons in the STaCS Analysis module report window.

Prerequisite CO-TM-CA-04

1 Scope
Following the processes of PCR amplification and capillary electrophoresis coupled with detection, a data file is generated for each sample and control. These files are now waiting to be analyzed and interpreted by a qualified analyst. When problems arise during the processing of DNA samples, the analysts must be able to systematically reason through the possible causes and solutions utilizing the resources and guidelines covered during their training.

2 Objectives

2.1 Theoretical
Following the completion of training the trainee will be able to:

1. Describe what information can be gathered from the Sample View tabs.
2. Define Process Quality Values (PQVs).
3. List the different PQV levels of assessment.
4. List and define the flags associated with the Sample-Level Quality Assessments.
5. Describe how to customize table settings to display certain PQVs.
6. Discuss the different analysis settings found in the Analysis Method Editor and describe their function.
7. Discuss the difference between the Advanced and Classic Peak Detection Algorithm.
8. Define the thresholds for each genetic analyzer platform with regards to analysis, ladder evaluation and internal size standard evaluation.
9. Describe the guidelines that have been established for data interpretation.
10. Develop a systematic approach for data interpretation and troubleshooting.

2.2 Practical
Following the completion of training the trainee will be able to:

1. Navigate through GeneMapper ID-X.
2. Use the various editors and managers in the software to customize views and settings.
3. Use and interpret the appropriate supporting plate documentation.
4. Navigate through the STaCS Analysis module.
5. Examine and interpret size standards, allelic ladders, controls, and sample data using GeneMapper ID-X.

6. Identify problems with data and give the possible causes and recommend solutions to remedy the problem.

7. Perform the report analysis through STaCS.

8. Archive data and maintain the analysis computer.

3 Training Outline

3.1 Lesson Plan

A. GeneMapper ID-X software

1. GeneMapper ID-X login

2. Project window
   a) Navigation pane
   b) Toolbar icons
      i. Add Samples to Project
      ii. Display Plots
      iii. Report Manager
      iv. Label Edit Viewer
      v. Size Match Editor
      vi. Analysis Method Editor
      vii. Panel Manager
      viii. GeneMapper ID-X Manager
      ix. Analyze
      x. Low Quality on Top
      xi. Table Setting
      xii. Table Setting Editor

   c) Sample view
      i. Sample columns view
      ii. Info tab
      iii. Raw Data tab
      iv. EPT (Electrophoresis, Power, and Temperature) Data tab

   d) Sample columns
      i. Sample File
      ii. Sample Type
      iii. Size Standard
      iv. Panel
v. Analysis Method

e) Process Quality Values - PQVs
   i. Sizing Quality Assessment
   ii. Allelic Ladder Quality Assessment
   iii. Marker-Level Quality Assessment
   iv. Genotype Quality Assessment
   v. Sample-Level Quality Assessments

f) Genotype view
   i. Panels
   ii. Markers
   iii. Alleles

3. Panel Manager
   a) Kit
   b) Panel
   c) Locus (marker)
      i. Loci range
      ii. Stutter Ratio
   d) Bin
      i. Bin set
      ii. Offsets
      iii. Virtual alleles

4. GeneMapper ID-X Manager
   a) Projects
   b) Analysis Methods
      i. Bin Set assignment
      ii. Global Cut-off Value
      iii. Peak Detection Algorithm
      iv. Size Calling Method
      v. Smoothing and Baselining
      vi. Minimum Peak Half Width
      vii. Polynomial Degree
      viii. Peak Window Size
      ix. Analysis range and excluding primer peaks
      x. Peak Amplitude Thresholds
xi. Homozygous min peak height
xii. Heterozygous min peak height
xiii. Max peak height
xiv. Minimum peak height ratio
xv. Maximum expected alleles
xvi. PQVs
c) Table Settings
d) Plot Settings
e) Size Standards
f) Report Settings

5. Report Manager
   a) Report Setting
      i. STaCS
      ii. Export
      iii. Allele call

B. Supporting plate documentation
   1. Analysis Form (LAB-CO-05)
   2. PickSample amp sheets and run sheets (STaCS)
      a) DNA template/amplicon volumes
      b) Re-injections if applicable
   3. Plate Detail Sheets (STaCS)
      a) Re-injections
      b) Plate set-up information

C. STaCS Analysis module
   1. Selecting plate from the appropriate queue
      a) Analysis
      b) Technical Review
   2. Establishing plate ownership

D. Preliminary examination of data
   1. Analytical threshold
      a) Investigator 24plex GO!
         i. 100rfu for the 3500xl
         ii. 60rfu for the 3130xl
      b) Identifiler Direct
i. 100rfu for the 3130xl
ii. 150rfu for the 3730
iii. 85rfu for the 3500xl

c) Identifiler and Yfiler
i. 100rfu for the 3130xl

2. Stochastic Threshold
   a) Investigator 24plex GO!
      i. 175rfu for the 3500xl
      ii. 135rfu for the 3130xl

3. Internal size standard
   a) Reviewing the internal size standard for all data
      i. Threshold
      ii. Observe PQVs – SQ
      iii. Raw data
   b) Plot setting
      i. Check LIZ Size Standard
   c) Size match editor
      i. Examine sizing quality
   d) Size standard shift
      i. Observe data points

4. Allelic ladder
   a) Evaluate the alleles for correct labeling
      i. Allele shift
      ii. Resolution
   b) Examine peak morphology of alleles
   c) Check documentation if ladder(s) are reinjected

5. Off-scale data
   a) Review PQVs - SOS
   b) Observe Relative Fluorescence Units (RFU)
      i. CE instrument specific
   c) Review raw data

E. Interpretation of analyzed data

1. Allele Identification
   a) True alleles
b) Peaks below the analytical threshold

c) Stochastic effects or allelic dropout

d) Low signal

e) Inhibited samples

f) No signal / null alleles

g) Poor resolution

h) Spikes

2. Controls

() denotes STaCS nomenclature

a) Positive (STaCS barcode for control)

b) Amplification negative (Ampblank)

c) Reagent blank (Negative)

3. Artifacts

a) Pull-up

b) Spikes

c) Stutter

d) Dye blobs

e) Minus A

f) Kit related artifacts

g) Non-specific amplification

h) Capillary issues

4. Contamination

a) True contamination

b) Chimeras

5. Off-ladder (OL) alleles

a) Microvariants

i. Designation

b) Out of Marker Range (OMR)

c) Inter Loci Allele (ILA)

6. Triple alleles

a) Balanced – Type II triple alleles

b) Imbalanced – Type I triple alleles

7. Peak imbalance

a) Peak height ratios
b) Overall sample health

c) Primer mutations

8. Stochastic effect and allelic dropout

a) Degraded DNA

b) Low copy number DNA

c) Null alleles

9. Re-injections

a) Validation constraints

b) Reagent blank (Negative)
   i. Most sensitive injection time
   ii. Changing capillary electrophoresis platform

F. Troubleshooting – developing a systematic approach

1. Identifying problems with data

   a) Established guidelines (CODIS SOP)

   b) GeneMapper ID-X software tools
      i. PQVs
      ii. Raw data
      iii. Sample info
      iv. EPT data

   c) Pattern recognition
      i. Kits
      ii. Capillary electrophoresis platform
      iii. Reagents

   d) Analyst discretion

2. Assigning proper rework points based on workflow level

   a) Capillary electrophoresis (Post PCR)
      i. Injection / run-time issues

   b) Capillary electrophoresis (Electrophoresis Plate Prep - EPP)
      i. Injection / run-time issues
      ii. TECAN / manual set-up issues

   c) Amplification (Master Mix Addition - MMA)
      i. TECAN / manual set-up issue
      ii. Template volume
      iii. Peak imbalance confirmation
d) Pre-amplification (Plate Preparation)
   i. Re-punch
   ii. Water wash

e) Extraction (Plate Create)
   i. EZ1 / QIAssymphony plate create

3. Assigning proper rework reason
   i. Utilizing the Analysis Form (LAB-CO-05) legend
   ii. Resolving discrepancies between primary and secondary reviewer
   iii. Technical leader resolution

G. Generating and exporting a STaCS report
   1. Selecting samples/controls for report
      a) Single CODIS number representative
      b) Controls
      c) Allelic ladder
   2. Exporting report from Genemapper ID-X
      a) Report manager
         i. Report setting – STaCS
         ii. M:\DataAnalysis\Output

H. STaCS report analysis
   1. Analysis module (STaCS)
      a) Selecting plate from appropriate queue
      b) Analyze/Review button
         i. Review control profiles
         ii. Process sample profiles
      c) Rework assignments
         i. Proper rework point
         ii. Proper rework reason
         iii. Additional information in “Comments” field
      d) Verify consistency of rework information with Analysis Form (LAB-CO-05)
      e) Verify rework points/reasons of primary reviewer if applicable
      f) Verify profile consistency with previous runs if applicable
      g) Review all of the filtered sample screens
      h) Save
      i) Verify information in Data Analysis Outcome Window
2. Export project from Genemapper ID-X
   a) Archive in run folder
      i. M:\DataAnalysis\Working folder for First reads
      ii. M:\DataAnalysis\Archive folder for Second reads

3.2 Required Readings


CO-03-06 Data Interpretation Guidelines, CODIS SOP. Texas DPS Crime Laboratory.

CO-03-06A Response to Contamination. CODIS SOP. Texas DPS Crime Laboratory.

LAB-CO-05 Analysis Form. CODIS SOP. Texas DPS Crime Laboratory.

SWGDAM Interpretation Guidelines for Autosomal STR Typing by Forensic DNA Testing Laboratories (excluding mixture interpretation).

Optional: SWGDAM Interpretation Guidelines for Y-Chromosome STR Typing by Forensic DNA Testing Laboratories (excluding mixture interpretation).


4 Practice

4.1 Observed Performance

The trainee will observe the trainer use Genemapper ID-X as well as STaCS to analyze and interpret data including:

1. Establishing plate ownership in STaCS
2. Internal size standard evaluation
3. Ladder and control evaluation
4. Sample interpretation, troubleshooting, and rework assignment
5. Generating and exporting a report
6. Report analysis in STaCS
7. Data archiving
4.2 Supervised Performance

Under the supervision of the trainer, the trainee will analyze and interpret data from a set of known Investigator 24plex GO! samples run in the previous CE exercise, including all of the tasks included in the Observational Exercises.

Under the supervision of the trainer, the trainee will analyze and interpret data from a full plate of known Investigator 24plex GO! samples run in the previous CE exercise, including all of the tasks included in the Observational Exercises.

Optional: Under the supervision of the trainer, the trainee will analyze and interpret data from a set of known Identifiler samples run in the previous CE exercise, including all of the tasks included in the Observational Exercises.

Optional: Under the supervision of the trainer, the trainee will analyze and interpret data from a full plate of known Identifiler Direct samples run in the previous CE exercise, including all of the tasks included in the Observational Exercises.

Optional: Under the supervision of the trainer, the trainee will analyze and interpret data from a set of known Yfiler samples run in the previous CE exercise, including all of the tasks included in the Observational Exercises.

The exercises will be utilizing the STaCS test server.

5 Assessment

5.1 Competency and Qualifying Examination

Using the data generated from the previous assessment, the trainee will independently analyze the set of Investigator 24plex GO! samples utilizing the STaCS test server.

Using the data generated from the previous assessment, the trainee will independently analyze the full plate of previously analyzed Investigator 24plex GO! samples utilizing the STaCS test server.

Optional: Using the data generated from the previous assessment, the trainee will independently analyze the set of Identifiler samples utilizing the STaCS test server.

Optional: Using the data generated from the previous assessment, the trainee will independently analyze the full plate of previously analyzed Identifiler Direct samples utilizing the STaCS test server.

Optional: Using the data generated from the previous assessment, the trainee will independently analyze the set of Yfiler samples utilizing the STaCS test server.

The trainer will administer a written examination. Incorrect responses will be reviewed and/or remediated with the trainee.

Successful completion of this module is determined by the trainer.
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AUTOMATED BLOOD SPOTTING ONTO ARCHIVE CARDS USING TECAN FREEDOM EVO-150 ROBOT

Duration 1 to 2 months
Purpose Trainee will become familiar with the proper procedure for spotting whole blood onto blood archive cards using the Tecan Freedom Evo-150.
Prerequisite CO-TM-GEN-06

1 Objectives

1.1 Theoretical

The trainee will need to be familiar with both the operational aspects of using the robotic device as well as understand the importance of maintaining proper accountability of the samples as they are handled. Quality assurance standards also require the analyst to annotate successful completion of these steps, and the proper annotation of any event which will affect the downstream handling or analysis of the samples.

1.2 Practical

Following the completion of training the trainee will be able to:

1. Identify the CODIS system to identify/locate an offender sample.
2. Identify the major components of the Tecan robot.
3. Describe the blood archive card and define its purpose.
4. Describe hazards and precautions associated with handling blood products.
5. Prepare blood samples for spotting onto archive cards.
6. Prepare Tecan robot for operation.
7. Identify commonly observed difficulties with Tecan robot operation.
8. Load correct software and assay for procedure.
10. Identify two software "crash" scenarios and responses.
11. Correctly end the assay and shut down the instrument.
12. Properly maintain the robotic device.
13. Demonstrate proper handling of samples and biohazardous materials generated.
14. Properly annotate batch records.

1.3 Theory

Because of the high volume of samples processed through the offender laboratory, it is more efficient to use automated platforms for executing certain functions related to sample processing.

2 Training Outline

2.1 Lesson Plan

I. Identify the CODIS numeric system to identify/locate an offender sample.
A. Numbering and barcode system used in the laboratory.
B. Location of a sample using rack numeric system.

II. Identify the major components of the Tecan robot.
A. PC computer.
B. EVOware software used with the Tecan robot.
C. Tecan robot platform and arm configurations.
D. Blood archive card racks.
E. Tip disposal container.
F. 16-position linear racks and rack positions.

III. Describe the blood archive card and define its purpose.
A. FTA sheet used by CODIS lab.
B. Desirable features of FTA treatment.
   1. Protection of DNA
   2. Neutralization of blood-borne pathogens
   3. Long term storage at room temperature
C. Uses of the blood archive card.
   1. Match Verification
   2. Re-amplification of failed samples
   3. Safe transport of sample (if needed)

IV. Describe hazards and precautions associated with handling blood products.
A. Blood-borne pathogens.
B. Environmental pathogen control measures.
C. Personal protective clothing and procedures.
D. Tecan robot specific hazards.

V. Preparation of blood samples for spotting onto archive cards.
A. Safe methods in opening tubes for spotting.
B. Verify rack position of all blood tubes selected for spotting.
C. Maintain vapor hood as necessary.
D. Verify blood archive cards have been correctly labeled.
VI. Prepare Tecan robot for operation.
   A. Properly seat all racks and tips on deck.
   B. Turn on the robot and computer system.
   C. Operate the EVOware software.
   D. Double check the proper position of all components on the deck.
   E. Prepare tips for robot.
   F. Choose appropriate script to be used.
   G. Shut down the computer and turn off the robot.

VII. Identify commonly observed difficulties with Tecan robot operation.
   A. Double-tipping and tip stacking.
   B. Tips towering in waste station.
   C. Bent or clogged tips.
   D. Blood clots in tubes.
   E. Emergency assay halting procedure.

VIII. Load correct software and assay for procedure.

IX. Perform spotting of blood onto archive cards without incident.
   A. Run the assay.
   B. Observe barcode number of tubes and archive cards.
   C. Replace used tips and re-cap each blood tube.
   D. Perform manual spotting as required.
E. Perform correct procedure for temporarily suspending assay operation.
F. Correctly restart procedure from an interruption.

X. Identify two software "crash" scenarios and responses.
   A. Blue screen, registry loading error.
   B. Program becomes completely unresponsive.

XI. Correctly end the assay and shut down the instrument.
   A. Return to main menu.
   B. Quit EVOware program.
   C. Clean platform and return blood tubes to storage.
   D. Power down the Tecan robot.
   E. Power down the PC computer.

XII. Perform user level maintenance as required according to the Tecan Freedom EVO Operating Manual (documented using the provided Freedom EVO Maintenance and Service LOGBOOK).

2.2 Required Readings
2. Tecan Freedom EVO Operating Manual, part number BG/N:30018610.02 (also available on CD BG/N:30018699.02).
5. CODIS Standard Operating Procedures. Texas Department of Public Safety Crime Laboratory.

3 Practice
3.1 Safety
Wear a lab coat and gloves when working in the laboratory. Safety glasses or goggles may be required during some operations, such as the opening of blood tubes where the blood may aerosolize.

Use extreme caution when operating robots. Do not place arms or head in the path of a moving arm.

3.2 Supervised Performance
Quality control
Cleaning schedule of equipment as noted in the CODIS SOP. Documentation and use of required forms when operating specific equipment.
Demonstration by trainer and/or supervised performance
Trainer will demonstrate proper procedures for spotting blood onto archive cards using the Tecan 150. Trainer will give instructions for cleaning robotic workspace and blood card platforms as required. Trainer will give instructions on supplies needed to perform this procedure. Trainer will demonstrate proper handling of single samples, decapping blood tubes, and pipetting techniques. Trainer will give instruction on the disposal of used and contaminated supplies.

3.3 Independent Exercises

After a complete demonstration of the process, assign the analyst a group of labeled offender blood samples to transfer onto archive cards. Provide an adjustable pipette (100-1000µL) and suitable tips for both the pipette and the robot. Suitable protective clothing required.

The analyst will concentrate on the following areas: CODIS laboratory work batch generation procedure, the basic operation of the Tecan Freedom EVO 150 robot and the EVOware software, CODIS blood-borne pathogen Exposure Control Plan, and relevant FTA-related literature.

4 Assessment

4.1 Test Assessment
None.

4.2 Additional requirements prior to using in batchwork
Successful completion of this module is determined by the trainer.
Training Manual  
CODIS  
Subject: Automated Blood Spotting

Preparer

Alyssandra Shaffer  
CODIS Advisory Board Chair  
Date: 12/08/2011

Concurrence

Diana D. Salas  
Quality Assurance Specialist  
Date: 12/13/2011

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Advisory Board |
AUTOMATED DNA EXTRACTION ON THE QIAGEN BIOROBOT EZ1

Duration 3 to 5 days
Purpose Trainee will recover and isolate DNA using the Qiagen BioRobot EZ1
Prerequisite CO-TM-GEN-06

1 Objectives

1.1 Theoretical

Trainee will:

1. Describe and become familiar with the protocol for extracting DNA from blood archive cards using the Qiagen BioRobot EZ1.
2. Describe and become familiar with the protocol for extracting DNA from buccal swabs using the Qiagen BioRobot EZ1.
3. Understand the quality control and precautionary measures associated with these two DNA extraction methods.

1.2 Practical

Following the completion of training the trainee will be able to:

1. Prepare the necessary reagents used in the EZ1 DNA extraction protocol, if needed.
2. Perform the necessary precautions to prevent contamination during the EZ1 DNA extraction protocol.
3. Isolate DNA from blood archive cards or buccal swabs using the BioRobot EZ1 and EZ1 DNA extraction protocol.
4. Perform and document the necessary quality control measures taken during the EZ1 DNA extraction protocol.

1.3 Theory

Proper technique is needed to ensure that DNA samples are thoroughly extracted so as not to disrupt the process of DNA typing.

2 Training Outline

2.1 Lesson Plan

I. Isolate DNA from blood archive cards (1, pgs 28-32; 2, CO-03-01; 3, pgs 23-24, 46-48; 4)
II. Isolate DNA from buccal swab cutting (1, pgs 28-32; 2, CO-03-01; 3, pgs 23-24, 46-48; 4)
III. Quality Control (2, CO-03-06)
   A. Worksheet documentation, including lot records
   B. Regent blanks

2.2 Required Readings

2. CODIS Standard Operating Procedures. CO-03-01 EZ1 Extraction and CO-03-06 STR Analysis Guidelines. Texas Department of Public Safety Crime Laboratory.


3 Practice

3.1 Safety
Wear lab coat and gloves when working in the laboratory. Safety glasses or goggles may be required during some operations.

3.2 Equipment, Materials, and Reagents
BioRobot EZ1
EZ1 DNA Investigator Kit
FTA Punch or Buccal Swab
Incubator

3.3 Reagent/EZ1 Investigator Kit Preparation
Trainee will prepare any kit materials as needed.

3.4 Quality Control
A. Documentation and use of required worksheets.
B. Reagent blanks for each set of extractions as noted in the CODIS SOP.

3.5 Supervised Performance
A. Trainer will give instruction and/or demonstrate the use of the BioRobot EZ1.
B. Trainer will give instruction and/or demonstrate the use of the EZ1 DNA Investigator Kit.
C. Trainer will discuss correct documentation and QC of samples.

3.6 Independent Exercises
A. Trainee will extract samples using the BioRobot EZ1 and the EZ1 DNA Investigator Kit. All analysts will use FTA punches. Additional training with buccal samples will be determined by trainer and Lab Manager.
B. These extractions will be stored and used for PCR Amplification exercises in CO-TM-DNA-02

4 Conclusion

4.1 Test Assessment
The trainer will administer a written examination.

4.2 Additional requirements prior to using in batchwork
Successful completion of this module is determined by the trainer.
Preparer

Gary Molina
CODIS State Manager

Date: 12/16/2009

Concurrence

Zoë M. Smith
Quality Assurance Specialist

Date: 12/16/2009

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AUTOMATED BUCCAL LYSIS SET-UP

Duration 1 to 2 weeks

Purpose Trainee will become familiar with the proper procedure for preparing buccal swabs for direct amplification

Prerequisite CO-TM-CA-02

1 Scope

Direct amplification kits contain enhanced buffers that are more tolerant to PCR inhibitors eliminating the need to extract and purify samples prior to amplification. Samples collected on FTA can immediately proceed to amplification since cells are already lysed. Unlike FTA, Omni Swabs contain untreated filter paper and require a lysis step prior to direct amplification.

2 Objectives

1.1 Theoretical

Following the completion of training, the trainee will:

A. Explain the importance of lysing cells prior to direct amplification
B. Describe the buccal lysis procedure
C. List and explain the different components of the Multidrop DW plate filler
D. Describe the proper maintenance of the Multidrop DW plate filler
E. Describe the proper maintenance of the Tecan 200 robot
F. List precautionary measures taken to limit contamination

1.2 Practical

Following the completion of training, the trainee will be able to:

A. Utilize STaCS to identify/locate available buccal plates for processing
B. Perform quality control measures to prevent contamination
C. Prepare a lysis plate using the Multidrop DW plate filler
D. Incubate the lysis plate using the thermomixer/heat block
E. Create a daughter plate using the Tecan 200 robot
F. Complete the Lysis and Daughter Plate Create modules in STaCS

2 Training Outline

2.1 Lesson Plan

A. Identify buccal samples/plates for processing
   1. STaCS used in the laboratory
   2. Location of buccal samples/plates ready for processing
   3. Location of storage for processed lysis plates and daughter plates

B. Buccal plate lysis procedure
   1. Lysis module in STaCS
a) Scan plate
b) Get Scenario(s)
c) Scan buccal plate and reagents
d) Process

2. Operation of Multidrop DW plate filler
   a) Instrument parts
   b) Instrument prep
   c) Priming
d) Dispensing lysis buffer to plate
e) Emptying unused reagent into reservoir
f) General instrument maintenance

3. Heat Block/Thermomixer
   a) Operation
   b) Set temp and shaking speed (if applicable)
c) Allow plate to cool to room temperature
d) Centrifuge plate
e) Record Activity Completion Result

4. Daughter Plate Create module in STaCS
   a) Create Plate
   b) Plate Layout
c) Plate Source
d) Select lysis plate
e) Allocate
f) Create
g) Appropriate placement of barcode on daughter plate
h) Scan daughter plate
i) Get Scenario(s)

5. Tecan Operation
   a) Deck layout
   b) Scan daughter and lysis plates and robot
c) Process
d) EVOware software operation
   i. Run Direct
   ii. Tecan script
iii. Exit, unload drivers
iv. Move arms to home position
e) Record Activity Completion Result

6. Plate storage

C. Quality Control
   1. Reagent blank

2.2 Required Readings

CO-02-05 Buccal Lysis Set-up, CODIS SOP. Texas DPS Crime Laboratory.
Qiagen. Investigator 24plex GO! Handbook.
Tecan Freedom EVO Operating Manual.
Freedom EVOware Standard Getting Started Guide.

3 Practice

3.1 Safety

A. Use extreme caution when operating robots. Do not place arms or head in the path of a moving arm.
B. Wear proper personal protective equipment when working in the laboratory.
C. Body fluids and lysate may contain infective agents. Use universal precautions when handling.

3.2 Equipment, Materials, and Reagents

Centrifuge
96-well daughter plate
Pipette tips
Pipettes, adjustable
Appropriate seals
STR GO! Lysis Buffer
Prep-n-Go Buffer
Tecan Freedom EVO 200 MCA
Tecan EVOware Standard Software
Multidrop DW plate filler
Heat block
Thermomixer
3.3 Quality Control

A. STaCS modules for tracking and processing records
B. Reagent blanks (Negative) included in each lysis and daughter plate

3.4 Observed Performance

The trainee will observe the trainer prepare a buccal lysis plate using STR GO! Lysis Buffer including:

A. Navigating the Lysis module in STaCS
   1. Operating the Multidrop DW plate filler
   2. Operating the thermomixer
B. Navigating the Daughter Plate Create module
   1. Operating the Tecan 200 robot using the EVOware software
   2. Creating a daughter plate
C. Proper plate storage

Optional: The trainee will observe the trainer prepare a buccal lysis plate using Prep-n-Go Buffer with the Multidrop DW plate filler and the Tecan 200 robot.

3.5 Supervised Performance

Under the supervision of the trainer, the trainee will prepare a buccal lysis plate using STR GO! Lysis Buffer with the Multidrop DW plate filler and Tecan 200 robot. The exercise will utilize the STaCS test server.

Optional: Under the supervision of the trainer, the trainee will prepare a buccal lysis plate using Prep-n-GO Buffer with the Multidrop DW plate filler and Tecan 200 robot. The exercise will utilize the STaCS test server.

4 Assessment

4.1 Competency and Qualifying Examination

The trainee will independently prepare a buccal lysis plate using STR GO! Lysis Buffer with the Multidrop DW plate filler and Tecan 200 robot utilizing the STaCS test server.

Optional: The trainee will independently prepare a buccal lysis plate using Prep-n-Go Buffer with the Multidrop DW plate filler and Tecan 200 robot utilizing the STaCS test server.

A written exam is not required.

Successful completion of this module is determined by the trainer.
## Revision History

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BSD-600 OPERATION

Duration 1 to 2 weeks

Purpose The trainee will become familiar with the proper procedure for punching substrates into a 96-well amplification plate using the BSD-600 instrument

Prerequisite CO-TM-CA-02

1 Scope

The BSD-600 applies semi-automation to punch substrates into a 96-well amplification plate. Coupled with the use of a barcode reader and STaCS, the BSD-600 helps streamline the direct amplification workflow.

2 Objectives

2.1 Theoretical

Following the completion of training, the trainee will:

A. Describe how the BSD-600 operates
B. List the advantages of using FTA paper for archiving samples
C. List precautions taken when handling biological samples
D. Identify and explain the components of the BSD-600 robot
E. Identify and explain the components of the BSD-600 Duet software
F. List common BSD-600 errors and how to fix or navigate through the errors
G. Describe the general maintenance procedures for the BSD-600

2.2 Practical

Following the completion of training the trainee will be able to:

A. Utilize STaCS to identify/locate available samples for processing
B. Perform general maintenance on the BSD-600 instrument
C. Perform quality control measures to prevent contamination
D. Allocate samples to a plate using the Plate Create module in STaCS
E. Prepare an amplification plate using the Plate Preparation module in STaCS
F. Punch a plate of samples with the BSD-600 instrument using the Punch module in STaCS
G. Complete the Amplification module in STaCS

3 Training Outline

3.1 Lesson Plan

A. Identify/locate available samples for processing
   1. STaCS used in the laboratory
   2. Location of samples ready for processing
   3. Long term storage of processed samples
B. Blood FTA Archive Cards
   1. Advantages of FTA paper
      a) Preservation/protection of DNA
      b) Neutralization of blood-borne pathogens
      c) Long term storage at room temperature
   2. Optimal punching locations

C. Components of the BSD-600 robot
   1. PC computer
   2. BSD-600 Robotic Platform
   3. Air System
      a) Air pressure pump
      b) Anti-static humidifier system
      c) Dust extraction system
   4. Light Targeting System
   5. Disk Detector System
   6. Barcode Reader
   7. Automatic punch switch and foot switch

D. General BSD-600 maintenance
   1. Clean chute
   2. Clean instrument surface and work area
   3. Maintain appropriate amount of water in humidifier bottles

E. Common BSD-600 errors
   1. Static affecting punches
   2. Barcode undetected by barcode reader
   3. Chute misalignment
   4. Punching errors

F. Direct amplification protocol using the BSD-600 instrument
   1. Plate Create module in STaCS
      a) Selecting Plate Type, Protocol, and Sample Nature
      b) Create Plate
      c) Scan envelopes to allocate samples to plate
      d) Move controls to next available well
      e) Proper barcode placement
   2. Plate Preparation module in StaCS
a) Scan amplification plate
b) Get Scenario(s)
   i. Manual
   ii. Automated
c) Scan robot (if applicable), amplification plate, and consumables

3. Manual amplification master mix set up
   a) Prepare PCR reaction mix
   b) Aliquot into wells
   c) Process
   d) Record Activity Completion Result

4. Automated amplification master mix set up
   a) Turn on Tecan
   b) Prepare PCR reaction mix
   c) Prepare deck layout on Tecan
   d) Process
   e) EVOware software operation
      i. Run Direct
      ii. Tecan script
      iii. Exit, unload drivers
      iv. Move arms to home position
   f) Verify allocation of PCR reaction mix
   g) Record Activity Completion Result

5. BSD-600 Operation
   a) Turn on BSD-600 and air pressure pump
   b) Check water level in Humidifier Bottle
   c) Adjust flow screws for appropriate air pressure

6. Punch module in STaCS
   a) Scan BSD-600 instrument and amplification plate
   b) Create Input File
   c) BSD Duet software
      i. Log in
      ii. Continue
      iii. STaCS Plate
      iv. Verify Samples and Cleaning are checked
v. Scan plate
vi. Plate table layout
vii. Continue
viii. Scan card and follow prompts for punching and cleaning
ix. Punch all samples in queue
x. Negative punched last
xi. Verify all punches are present
xii. End Run
xiii. Exit BSD Main Menu
d) File Verification has completed, continue saving files?
e) Record Activity Completion Result
f) Turn off pump and BSD-600 instrument

7. Add positive control(s)
8. Plate transport to thermal cycling room
   a) Appropriate seal
   b) Centrifuge
9. Amplification module in STaCS
   a) Scan thermal cycler and amplification plate
   b) Select thermal cycler program
   c) Start Process
d) Close
e) Thermal cycling method
   f) Available plates
g) Complete Process

10. Proper plate storage

3.2 Required Readings

CO-03-12 Investigator 24plex GO! Amplification. CODIS SOP. Texas DPS Crime Laboratory.
Qiagen. Investigator 24plex GO! Handbook.

2010.


Optional: CO-03-09 Identifiler Direct Amplification, CODIS SOP. Texas Department of Public Safety Crime Laboratory.

4 Practice
4.1 Safety

Wear proper personal protective equipment when working with bloodborne pathogens in the laboratory. FTA fibers may become airborne during punching. Wear appropriate face masks. Use extreme caution when operating robots. Do not place hands or head in the path of moving parts.

4.2 Equipment Materials, and Reagents

STaCS computer
Centrifuge
Microcentrifuge tubes
96-well amplification plate
Pipette tips
Pipettes, adjustable
Vortex
Thermal cycler
Appropriate plate seal
Amplification cover
Investigator 24plex GO! kit
Investigator STR GO! Punch Buffer
AmpFISTR Identifiler Direct PCR Amplification Kit
TE buffer
Tecan EVO 100 (instrument, computer, and appropriate software)
BSD-600 (instrument, computer, and appropriate software)
DI water

4.3 Quality Control

A. Combined reagent blank and amplification negative for each set of punches
B. STaCS modules for tracking and processing records

4.4 Observed Performance

The trainee will observe the trainer amplify a plate of known samples with the Investigator 24plex GO! kit using the Tecan 100 and the BSD-600 including:

A. Creating and allocating samples to a plate in STaCS
B. Setting up the amplification PCR reaction mix utilizing the Plate Preparation module
C. Operating the BSD-600 instrument utilizing the Punch module
D. Adding the appropriate controls to the punch plate
E. Navigating the Amplification module and selecting the appropriate thermal cycling program
F. Proper plate storage
Optional: The trainee will observe the trainer amplify a plate of known samples with the Identifiler Direct kit using the Tecan 100 and the BSD-600. The exercise will utilize the STaCS test server.

4.5 Supervised Performance

Under the supervision of the trainer, the trainee will amplify a plate of known samples with the Investigator 24plex GO! kit using the Tecan 100 and the BSD-600. The exercise will utilize the STaCS test server.

Optional: Under the supervision of the trainer, the trainee will amplify a plate of known samples with the Identifiler Direct kit using the Tecan 100 and the BSD-600. The exercise will utilize the STaCS test server.

5 Assessment

5.1 Competency Set and Qualifying Examination

The trainee will independently amplify a plate of known samples with the Investigator 24plex GO! kit using the Tecan 100 and the BSD-600 utilizing the STaCS test server.

Optional: The trainee will independently amplify a plate of known samples with the Identifiler Direct kit using the Tecan 100 and the BSD-600 utilizing the STaCS test server.

A written exam is not required.

Successful completion of this module is determined by the trainer.
## Revision History

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AUTOMATED DNA EXTRACTION USING THE QIASYMPHONY SP

Duration 3 to 5 days

Purpose The trainee will recover and isolate DNA using the QIAsymphony.

Prerequisite CO-TM-GEN-06

1 Objectives

1.1 Theoretical

Trainee will:

- Describe and become familiar with the protocol for extracting DNA from blood archive using the QIAsymphony.
- Describe and become familiar with the protocol for extracting DNA from buccal swabs using the QIAsymphony.
- Understand the quality control and precautionary measures associated with this extraction method.

1.2 Practical

Following the completion of training, the trainee will be able to:

- Prepare the necessary reagents used in the QIAsymphony extraction protocol, if necessary.
- Perform the necessary precautions to prevent contamination during the QIAsymphony extraction process.
- Isolate DNA from blood archive cards or buccal swabs using the QIAsymphony.
- Perform and document the necessary quality control measures taken during the QIAsymphony extraction process.

1.3 Theory

Successful PCR amplification relies upon the isolation and purification of genomic DNA from forensic samples. Various robotic platforms are used in a high throughput laboratory setting to isolate and purify a large number of samples. Stringent precautionary and quality control measures are practiced during the extraction procedure.

2 Training Outline

2.1 Lesson Plan

A. Isolate DNA from blood archive
B. Isolate DNA from buccal swab cutting
C. Quality Control
   1. Worksheet documentation, including lot records
   2. Reagent blanks

2.2 Required Readings

B. CODIS Standard Operating Procedures. CO-03-11 QIAsymphony SP and CO-03-06 STR Analysis Guidelines. Texas Department of Public Safety Crime Laboratory.


3 Practice

3.1 Safety

Appropriate personal protective equipment must be worn during reagent preparation and use. Body fluids may contain infective agents. Use universal precautions during handling.

Use caution when operating robotic equipment. The hood should be closed to avoid moving parts while the instrument is running.

Liquid waste should be disposed properly.

3.2 Equipment, Materials, and Reagents

QIAsymphony SP
QIAsymphony DNA Investigator Kit
Reagent cartridge
Reagent cartridge holder
Enzyme rack
Sample prep cartridges
Piercing lid
8-rod covers
Disposable filter tips
Spin baskets
1.5µL microcentrifuge tubes
S-block (or other appropriate elution plate)
Buffer ATL
Proteinase K
Biohazard bag
Heat block
Pipettors, adjustable
Pipette tips
Vortex
Tape Pads

3.3 Reagent Preparation

Trainee will prepare any kit materials as needed.

3.4 Quality Control

A. Documentation and use of required worksheets.
B. Reagent blanks for each set of extractions as noted in the CODIS SOP.

3.5 **Supervised Performance**

A. Trainer will give instructions and/or demonstrate the use of the QIA symphony.

B. Trainer will explain the components in the QIA symphony DNA Investigator Kit.

C. Trainer will discuss correct documentation and QC of samples

3.6 **Independent Exercises**

A. Trainee will extract at least two blood and two buccal samples using the QIA symphony and the QIA symphony DNA Investigator Kit.

B. These extractions will be stored and used for PCR amplification exercises in CO-TM- DNA-02.

4 **Assessment**

4.1 **Test Assessment**

None

4.2 **Additional requirements prior to using in batchwork**

Successful completion of this module is determined by the trainer.
Preparer

Alyssandra Shaffer  Date: 04/21/2014
Advisory Board Chair

Concurrence

Katherine G. Sanchez  Date: 04/21/2014
Quality Assurance

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# CODIS Analyst Training Checklist

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## CO-TM-01 CODIS Overview

**Required Readings**
- [ ] CO-TM-01 Overview of CODIS Training Program

## CO-TM-02 Introduction to CODIS / History of CODIS Program

**Required Readings/Media Materials**
- [ ] CO-01-01 Overview. CODIS SOP. Texas DPS Crime Laboratory
- [ ] CO-02-01 Sample Collection and Handling (Section 2). CODIS SOP. Texas DPS Crime Laboratory
- [ ] Texas CODIS Legislation History (handout)

**Activities**
- Discuss Chapter 1 in *Fundamentals of Forensic DNA Typing* by John M. Butler
- Discuss Chapter 12 in *Fundamentals of Forensic DNA Typing* by John M. Butler
- Discuss Federal and State Legislation regarding DNA Databases

**Assessment**
- [ ] Written Examination

## CO-TM-CA-01 Introduction to Forensic DNA Analysis

**Required Readings**
- [ ] Cushwa, William T. and J.F. Medrano. “Effects of Blood Storage Time and Temperature on DNA Yield and Quality.” *Biotechniques, 14:204-205*
- [ ] SWGDAM Contamination Prevention and Detection Guidelines for Forensic DNA Laboratories

**Activities**
- Discuss *The Evaluation of Forensic DNA Evidence*
- Discuss Chapter 2 in *Fundamentals of Forensic DNA Typing* by John M. Butler
- Discuss Chapter 3 in *Fundamentals of Forensic DNA Typing* by John M. Butler
- Discuss Chapter 1 in *Advanced Topics in Forensic DNA Typing: Methodology* by John M. Butler
- Discuss Effects of Blood Storage Time and Temperature on DNA Yield and Quality by Cushwa and Medrano

**Assessment**
- [ ] Written Examination
## CO-TM-CA-02 EZ1 Advanced XL Extraction

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<th>Requirement</th>
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### Required Readings
- CO-03-01 EZ1 Advanced XL Extraction. CODIS SOP. Texas DPS Crime Laboratory
- Qiagen. *EZ1 DNA Investigator Handbook*
- Qiagen. *EZ1 Advanced XL User Manual*

### Activities
- Discuss topics dealing with contamination including maintaining sample integrity and methods used to avoid contamination
- Discuss the parts and use of the EZ1 Advanced XL robot
- Discuss the components and use of the EZ1 DNA Investigator kit including reagent preparation
- Discuss and observe kit receiving and container breakdown in STaCS
- Discuss and observe the use of Plate Create module in STaCS test server
- Discuss and observe the use of EZ1 Processing module in STaCS test server
- Discuss and observe the EZ1 Advanced XL extraction process

### Observed Performance
- Observe the trainer extract a set of samples on the EZ1 Advanced XL. The exercise will utilize the STaCS test server.

### Supervised Performance
- Under the supervision of the trainer, trainee will extract a set of samples on the EZ1 Advanced XL. These extractions will be stored and used for the exercises in CO-TM-CA-03. The exercise will utilize the STaCS test server.

### Assessment
- Written Examination
- The trainee will independently extract a minimum of 5 samples on the EZ1 Advanced XL utilizing the STaCS test server. These extractions will be stored and used for the amplification competency set in CO-TM-CA-03.
## CO-TM-CA-03 Amplification

<table>
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<th>Activity</th>
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<td>Qiagen. Investigator 24plex Go! Handbook</td>
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<tr>
<td>CO-03-12 Investigator 24plex Go! Amplification. CODIS SOP. Texas DPS Crime Laboratory</td>
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<tr>
<td>Optional: CO-03-04 Identifiler Amplification. CODIS SOP. Texas DPS Crime Laboratory</td>
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<tr>
<td>Optional: CO-03-09 Identifiler Direct Amplification. CODIS SOP. Texas DPS Crime Laboratory</td>
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<td>Optional: CO-03-08 Yfiler Amplification. CODIS SOP. Texas DPS Crime Laboratory</td>
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### Activities

- Discuss topics dealing with contamination including maintaining sample integrity and methods to avoid contamination.
- Discuss how STaCS workflows lead into amplification.
- Discuss the kits currently used in the laboratory, including components, volumes used, and thermocycler parameters.
- Discuss and observe the simulation of amplification plates through the STaCS test server including workflow determination, Master Mix Addition (MMA) module, and manual and automated scenarios.
- Discuss the QA/QC measures taken for amplification.
- Optional: Discuss and observe the amplification set-up for manual and automated amplification with Identifiler.
- Discuss and observe the amplification set-up for manual and automated amplification with Investigator 24plex Go!.
- Discuss and observe post amplification cleanup including decontamination and replenishing consumables.
- Discuss and observe the Amplification module in STaCS and selecting a thermocycler program.

### Observed Performance

- Observe the trainer manually set up and amplify known samples from EZ1 extracts using Investigator 24plex Go!. The exercise will utilize the STaCS test server.
- Observe the trainer manually set up and amplify known samples from EZ1 extracts using Investigator 24plex Go! using the automated scenario. The exercise will utilize the STaCS test server.
- Optional: Observe the trainer manually set up and amplify known samples from EZ1 extracts using Identifiler. The exercise will utilize the STaCS test server.
- Optional: Observe the trainer manually set up and amplify a plate of known samples with Identifiler Direct using the automated scenario. The exercise will utilize the STaCS test server.
- Optional: Observe the trainer manually set up and amplify a plate of known samples with Identifiler Direct using the automated scenario. The exercise will utilize the STaCS test server.

### Supervised Performance

- Under supervision, the trainee will manually set up and amplify known samples from EZ1 extracts using Investigator 24plex Go!. The exercise will utilize the STaCS test server. The amplification plate will be used in the CO-TM-CA-04 exercise.
- Under supervision, the trainee will manually set up and amplify a plate of known samples with Investigator 24plex Go! using the automated scenario. The exercise will utilize the STaCS test server. The amplification plate will be used in the CO-TM-CA-04 exercise.
### CO-TM-CA-03 Amplification

<table>
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- Optional: Under supervision, the trainee will manually set up and amplify known samples from EZ1 extracts using Identifiler. The exercise will utilize the STaCS test server. The amplification plate will be used in the CO-TM-CA-04 exercise.

- Optional: Under supervision, the trainee will set up and amplify a plate of known samples with Identifiler Direct using the automated scenario. The exercise will utilize the STaCS test server. The amplification plate will be used in the CO-TM-CA-04 exercise.

- Optional: Under supervision, the trainee will manually set up and amplify known samples from EZ1 extracts using Yfiler. The exercise will utilize the STaCS test server. The amplification plate will be used in the CO-TM-CA-04 exercise.

### Assessment

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- Written Examination
- The trainee will independently amplify a minimum of 5 samples from an EZ1 extraction with Investigator 24plex GO! using the manual scenario in the STaCS test server. This plate will be stored and used for the capillary electrophoresis competency set in CO-TM-CA-04.
- The trainee will independently amplify a plate of known samples with Investigator 24plex GO! using the automated scenario in the STaCS test server. This plate will be stored and used for the capillary electrophoresis competency set in CO-TM-CA-04.
- Optional: The trainee will independently amplify a minimum of 5 samples from an EZ1 extraction with Identifiler using the manual scenario in the STaCS test server. This plate will be stored and used for the capillary electrophoresis competency set in CO-TM-CA-04.
- Optional: The trainee will independently amplify a plate of known samples with Identifiler Direct using the automated scenario in the STaCS test server. This plate will be stored and used for the capillary electrophoresis competency set in CO-TM-CA-04.
- Optional: The trainee will independently amplify a minimum of 5 samples from an EZ1 extraction with Yfiler using the manual scenario in the STaCS test server. This plate will be stored and used for the capillary electrophoresis competency set in CO-TM-CA-04.

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### CO-TM-CA-04 Capillary Electrophoresis (CE)

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### Required Readings

- CO-03-05 Capillary Electrophoresis, CODIS SOP. Texas DPS Crime Laboratory
- Applied Biosystems. 3130/3130xl Genetic Analyzers, Getting Started Guide
- Applied Biosystems. 3130/3130xl Maintenance, Troubleshooting and Reference Guide
- Optional: Applied Biosystems. 3730/3730xl DNA Analyzer Getting Started Guide
- Applied Biosystems. 3500/3500xl Genetic Analyzer User Guide

### Activities

- Discuss the different genetic analyzer platforms and their components
- Discuss and observe the process of changing an array on each of the genetic analyzer platforms
- Discuss and observe the simulation of CE runs through the STaCS test server including the Electrophoresis Plate Prep module, both manual and automated scenarios for all platforms, and the Post PCR module
- Discuss and observe sample CE set up including aliquoting formamide/size standard, sample transfer,
## CO-TM-CA-04 Capillary Electrophoresis (CE)

<table>
<thead>
<tr>
<th>and addition of allelic ladder using the manual and automated methods</th>
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<tr>
<td>Discuss and observe the evaluation of ladders, controls, troubleshooting, and Post PCR module completion</td>
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<tr>
<td>Discuss and observe the archiving and transfer of data</td>
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### Observed Performance

- Observe the trainer perform maintenance on the 3130xl genetic analyzer platform
- Observe the trainer perform maintenance on the 3500xl genetic analyzer platform
- Observe the trainer use the manual scenario to set up and run a set of previously analyzed Investigator 24plex GO! samples on the 3130xl
- Observe the trainer use the automated scenario to set up and run a plate of previously analyzed Investigator 24plex GO! samples on the 3500xl
- Optional: Observe the trainer use the manual scenario to set up and run a set of previously analyzed Identifiler samples on the 3130xl
- Optional: Observe the trainer use the automated scenario to set up and run a plate of previously analyzed Identifiler Direct samples on the 3500xl
- Optional: Observe the trainer use the manual scenario to set up and run a set of previously analyzed Yfiler samples on the 3130xl

### Supervised Performance

- Under the supervision of the trainer, the trainee will perform instrument maintenance on the 3130xl genetic analyzer platform
- Under the supervision of the trainer, the trainee will perform instrument maintenance on the 3500xl genetic analyzer platform
- Optional: Under the supervision of the trainer, the trainee will change an array
- Under the supervision of the trainer, the trainee will use the manual scenario to set up and run a set of previously analyzed Investigator 24plex GO! samples on the 3130xl. The exercise will utilize the STaCS test server. The data generated will be used for the exercise in CO-TM-CA-05.
- Under the supervision of the trainer, the trainee will use the automated scenario to set up and run a plate of previously analyzed Investigator 24plex GO! samples on the 3500xl. The exercise will utilize the STaCS test server. The data generated will be used for the exercise in CO-TM-CA-05.
- Optional: Under the supervision of the trainer, the trainee will use the manual scenario to set up and run a set of previously analyzed Identifiler samples on the 3130xl. The exercise will utilize the STaCS test server. The data generated will be used for the exercise in CO-TM-CA-05.
- Optional: Under the supervision of the trainer, the trainee will use the automated scenario to set up and run a plate of previously analyzed Identifiler Direct samples on the 3500xl. The exercise will utilize the STaCS test server. The data generated will be used for the exercise in CO-TM-CA-05.
- Optional: Under the supervision of the trainer, the trainee will use the manual scenario to set up and run a set of previously analyzed Yfiler samples on the 3130xl. The exercise will utilize the STaCS test server. The data generated will be used for the exercise in CO-TM-CA-05.

### Assessment

- Written Examination
  - Using the extracted samples amplified with Investigator 24plex GO! from the previous assessment, the trainee will independently set-up and run the samples on the 3130xl using the manual scenario utilizing the STaCS test server. The data generated will be used for the Data Interpretation competency in CO-TM-CA-05.
  - Using the plate of known samples amplified with Investigator 24plex GO! from the previous assessment, the trainee will independently set-up and run the samples on the 3500xl using the automated scenario utilizing the STaCS test server. The data generated will be used for the Data Interpretation competency in CO-TM-CA-05.
  - Optional: Using the extracted samples amplified with Identifiler from the previous assessment, the trainee will independently set-up and run the samples on the 3130xl using the manual scenario utilizing the STaCS test server. The data generated will be used for the Data Interpretation competency in CO-TM-CA-05.
### CO-TM-CA-04 Capillary Electrophoresis (CE)

<table>
<thead>
<tr>
<th>Trainer Initials</th>
<th>Date Completed</th>
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</thead>
<tbody>
<tr>
<td>Optional: Using the plate of known samples amplified with Identifier Direct from the previous assessment, the trainee will independently set-up and run the samples on the 3500xl using the automated scenario utilizing the STaCS test server. The data generated will be used for the Data Interpretation competency in CO-TM-CA-05.</td>
<td></td>
</tr>
<tr>
<td>Optional: Using the extracted samples amplified with Yfiler from the previous assessment, the trainee will independently set-up and run the samples on the 3130xl using the manual scenario utilizing the STaCS test server. The data generated will be used for the Data Interpretation competency in CO-TM-CA-05.</td>
<td></td>
</tr>
</tbody>
</table>

### CO-TM-CA-05 Data Interpretation

<table>
<thead>
<tr>
<th>Required Readings</th>
<th>Trainer Initials</th>
<th>Date Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butler, John M. Advanced Topics in Forensic DNA Typing: Interpretation. Elsevier Academic Press. 2015. Chapter 1: Data Interpretation Overview</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO-03-06 Data Interpretation Guidelines. CODIS SOP. Texas DPS Crime Laboratory</td>
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<tr>
<td>CO-03-06A Response to Contamination. CODIS SOP. Texas DPS Crime Laboratory</td>
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<tr>
<td>LAB-CO-05 Analysis Form. CODIS SOP. Texas DPS Crime Laboratory</td>
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<tr>
<td>SWGDAM Interpretation Guidelines for Autosomal STR Typing by Forensic DNA Testing Laboratories (excluding mixture interpretation).</td>
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<td></td>
</tr>
<tr>
<td>Optional: SWGDAM Interpretation Guidelines for Y-Chromosome STR Typing by Forensic DNA Testing Laboratories (excluding mixture interpretation).</td>
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<td></td>
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<tr>
<td>Applied Biosystems. GeneMapper ID-X Software Getting Started Guide</td>
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</table>

### Activities

- Discuss and observe GeneMapper ID-X including using various editors and managers to customize views and settings
- Discuss and observe the use and completion of the appropriate supporting plate documentation
- Discuss and observe the use and completion of the Analysis Form (LAB-CO-05)
- Discuss and observe the report analysis through STaCS
- Discuss and observe the archiving of data post report analysis
- Discuss and observe the troubleshooting of problematic data using the appropriate guidelines, software tools, and pattern recognition

### Observed Performance

- Observe the trainer use the Genemapper ID-X software as well as STaCS to analyze and interpret data

### Supervised Performance

- Under the supervision of the trainer, the trainee will analyze and interpret data from a set of known Investigator 24plex GO! samples run in the previous CE exercise
- Under the supervision of the trainer, the trainee will analyze and interpret data from a full plate of known Investigator 24plex GO! samples run in the previous CE exercise
- Optional: Under the supervision of the trainer, the trainee will analyze and interpret data from a set of known Identifier samples run in the previous CE exercise
<table>
<thead>
<tr>
<th>CO-TM-CA-05 Data Interpretation</th>
<th>Trainer Initials</th>
<th>Date Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optional: Under the supervision of the trainer, the trainee will analyze and interpret data from a full plate of known Identifiler Direct samples run in the previous CE exercise</td>
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</tr>
<tr>
<td>Optional: Under the supervision of the trainer, the trainee will analyze and interpret data from a set of known Yfiler samples run in the previous CE exercise</td>
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<table>
<thead>
<tr>
<th>Assessment</th>
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<tbody>
<tr>
<td>□ Using the data generated from the previous assessment, the trainee will independently analyze the set of Investigator 24plex GO! samples utilizing the STaCS test server</td>
<td></td>
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</tr>
<tr>
<td>□ Using the data generated from the previous assessment, the trainee will independently analyze the full plate of previously analyzed Investigator 24plex GO! samples utilizing the STaCS test server</td>
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</tr>
<tr>
<td>□ Optional: Using the data generated from the previous assessment, the trainee will independently analyze the set of Identifiler samples utilizing the STaCS test server</td>
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</tr>
<tr>
<td>□ Optional: Using the data generated from the previous assessment, the trainee will independently analyze the full plate of previously analyzed Identifiler Direct samples utilizing the STaCS test server</td>
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</tr>
<tr>
<td>□ Optional: Using the data generated from the previous assessment, the trainee will independently analyze the set of Yfiler samples utilizing the STaCS test server</td>
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<tr>
<th>Specialized Courses</th>
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Trainee Signature__________________________________________ Date__________

Trainer Approval__________________________________________ Date__________

Technical Leader Approval__________________________________ Date__________

Manager Approval__________________________________________ Date__________
<table>
<thead>
<tr>
<th>Trainee Name</th>
<th>Date Training Began</th>
<th>Page 1 of 3</th>
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</thead>
</table>

### CO-TM-01 CODIS Overview

<table>
<thead>
<tr>
<th>Required Readings</th>
<th>Date Completed</th>
<th>Trainer Initials</th>
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</thead>
<tbody>
<tr>
<td>☐ CO-TM-01 Overview of CODIS Training Program</td>
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</tbody>
</table>

### CO-TM-02 Introduction to CODIS / History of CODIS Program

<table>
<thead>
<tr>
<th>Required Readings</th>
<th>Date Completed</th>
<th>Trainer Initials</th>
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<tbody>
<tr>
<td>☐ CO-01-01 Overview. CODIS SOP. Texas DPS Crime Laboratory</td>
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<tr>
<td>☐ CO-02-01 Sample Collection and Handling (Section 2). CODIS SOP. Texas DPS Crime Laboratory</td>
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<tr>
<td>☐ Texas CODIS Legislation History (handout)</td>
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</table>

**Activities**

☐ Discuss Chapter 1 in Fundamentals of Forensic DNA Typing by John M. Butler

☐ Discuss Chapter 12 in Fundamentals of Forensic DNA Typing by John M. Butler

☐ Discuss Federal and State Legislation regarding DNA Databases

**Assessment**

☐ Written Exam

### CO-TM-CT-01 Blood Sample Collection and Handling

<table>
<thead>
<tr>
<th>Required Readings</th>
<th>Date Completed</th>
<th>Trainer Initials</th>
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<tbody>
<tr>
<td>☐ CO-02-01 Sample Collection and Handling (Sections 3-5). CODIS SOP. Texas DPS Crime Laboratory</td>
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<tr>
<td>☐ LAB-11 CODIS DNA Procedural Guidelines. CODIS SOP. Texas DPS Crime Laboratory</td>
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<tr>
<td>☐ LAB-CO-08 CODIS Blood Kit Collection Form. CODIS SOP. Texas DPS Crime Laboratory</td>
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</table>

**Activities**

☐ Discuss information listed on DNA Database Card

☐ Describe reasons for rejecting blood samples

☐ Observe trainer open a set of 72 blood collection kits

☐ Discuss information needed when taking phone orders for blood collection kits

☐ Package and ship a blood collection kit order

**Assessment**

☐ Under the supervision of the trainer, the trainee will open a set of 72 blood collection kits (at a minimum)
## CO-TM-CT-02 Buccal Sample Collection and Handling

### Required Readings
- CO-02-01 Sample Collection and Handling (Sections 3-5). CODIS SOP. Texas DPS Crime Laboratory
- LAB-11 CODIS DNA Procedural Guidelines. CODIS SOP. Texas DPS Crime Laboratory
- LAB-CO-08 CODIS Buccal Swab Collection Kit Order Form. CODIS SOP. Texas DPS Crime Laboratory

### Activities
- Discuss information listed on buccal DNA Database Card
- Describe reasons for rejecting buccal samples
- Observe trainer open a set of 72 buccal collection kits
- Discuss information needed when taking phone orders for buccal collection kits
- Package and ship a buccal collection kit order

### Assessment
- Under the supervision of the trainer, the trainee will open a set of 72 buccal collection kits (at a minimum)

## CO-TM-CT-03 Data Entry

### Required Readings
- CO-02-01 Sample Collection and Handling (Section 6). CODIS SOP. Texas DPS Crime Laboratory

### Activities
- Discuss the importance of ensuring the accuracy of each data submission in STaCS
- Observe the trainer enter a stack of 72 DNA Database Cards into STaCS

### Assessment
- Under the supervision of the trainer, the trainee will enter a stack of 72 DNA Database Cards into STaCS (at a minimum)

## CO-TM-CT-04 AFIS Verification

### Required Readings
- CO-02-01 Sample Collection and Handling (Sections 7 and 8). CODIS SOP. Texas DPS Crime Laboratory

### Activities
- Discuss reasons why AFIS would reject a sample
- Explain the difference between Redraw/Reject and Problem Kit in STaCS
- Discuss the importance of sorting out duplicate samples
- Explain the storage protocol for both the accepted and rejected cards
- Describe how a duplicate check is activated in STaCS
- Observe trainer verify a stack of 100 DNA Database Cards

### Supervised Performance
- Under the supervision of the trainer, the trainee will verify a stack of 100 DNA Database Cards (at a minimum)
## CO-TM-CT-05 Sample Preparation and Storage

### Required Readings
- CO-01-06 Sample Processing Records. CODIS SOP. Texas DPS Crime Laboratory
- CO-02-04 Blood Sample Preparation and Storage. CODIS SOP. Texas DPS Crime Laboratory
- CO-02-04B Buccal Sample Preparation and Storage. CODIS SOP. Texas DPS Crime Laboratory

### Activities
- Discuss precautionary measures when handling biohazardous material
- Explain the importance of shaking blood tubes prior to blood spotting
- Observe trainer prepare samples for a blood spotting run
- Observe trainer prepare buccal swabs for processing

### Assessment
- Under the supervision of the trainer, the trainee will prepare samples for a blood spotting run
- Under the supervision of the trainer, the trainee will prepare buccal swabs for processing

## CO-TM-CT-06 Blood Tube Destruction

### Required Readings
- CO-02-02 Sample Destruction (Sections 1 and 2.4) CODIS SOP. Texas DPS Crime Laboratory

### Activities
- Discuss when samples may be destroyed and how to determine which samples are ready to be destroyed
- Discuss proper handling and disposal of biohazardous material
- Observe the trainer dispose a rack of blood tubes

### Supervised Performance
- Under the supervision of the trainer, the trainee will dispose a rack of blood tubes (at a minimum)

## Additional Training

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<th>Date Completed</th>
<th>Trainer Initials</th>
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Trainee Signature ___________________________ Date ____________________

Trainer Approval ___________________________ Date ____________________

Technical Leader Approval __________________ Date ____________________

Manager Approval __________________________ Date ____________________
# CODIS Advanced Robotics Training Checklist

**Trainee Name** ___________________________  **Date Training Began** ___________________________

## CO-TM-ROBOT-01 Automated Blood Spotting

### Required Readings

<table>
<thead>
<tr>
<th>Trainer Initials</th>
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</table>

- Smith, LM and Burgoyne L., *Collecting, archiving and processing DNA from wildlife samples using FTA databasing paper*. BioMed Central Ecology. 2004. 4:4
- Tecan Freedom EVO Operating Manual
- Tecan EVOware Standard Software
- CO-02-04 Blood Sample Preparation and Storage, CODIS SOP. Texas DPS Crime Laboratory

### Activities

- Discuss and observe sample preparation, processing, and disposal of waste.
- Discuss and observe the Blood Spotting module in STaCS.
- Discuss and observe the operation of the Tecan 150 robot.
- Observe the trainer transfer blood samples onto archive cards using the Tecan EVO 150 robot. The exercise will utilize the STaCS test server.
- Under the supervision of the trainer, transfer blood samples onto archive cards using the Tecan EVO 150 robot. The exercise will utilize the STaCS test server.

### Assessment

- Optional: Written Examination
- Independently transfer blood samples onto archive cards using the Tecan EVO 150 robot utilizing the STaCS test server.

## CO-TM-ROBOT-06 Automated Buccal Lysis Set-up

### Required Readings

<table>
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<th>Trainer Initials</th>
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</table>

- CO-02-04B Buccal Swab Preparation and Storage. CODIS SOP. Texas DPS Crime Laboratory
- CO-02-05 Buccal Lysis Set-up. CODIS SOP. Texas DPS Crime Laboratory
- Qiagen. Investigator 24plex GO! Handbook
- Tecan Freedom EVO Operating Manual
- Freedom EVOware Standard Getting Started Guide
- Thermo Electron Corp. Multidrop DW User’s Manual

### Observed Performance

- Observe the trainer prepare a buccal lysis plate using STR GO! Lysis Buffer with the Multidrop DW plate filler and Tecan 200 robot. The exercise will utilize the STaCS test server.
- Discuss and observe the Lysis and Daughter Plate Creation modules in STaCS.
- Discuss and observe the operation of the Multidrop DW plate filler.
- Discuss and observe the operation of the Tecan 200 robot and EVOware software.
- Optional: Observe the trainer prepare a buccal lysis plate using Prep-n-Go Buffer with the Multidrop DW plate filler and Tecan 200 robot. The exercise will utilize the STaCS test server.

### Supervised Performance

- Under supervision of the trainer, prepare a buccal lysis plate using STR GO! Lysis Buffer with the Multidrop DW plate filler and Tecan 200 robot. The exercise will utilize the STaCS test server.
- Optional: Prepare a buccal lysis plate using Prep-n-Go Buffer with the Multidrop DW plate filler and Tecan 200 robot. The exercises will utilize the STaCS test server.

### Assessment

- Optional: Written Examination
- Independently prepare a buccal lysis plate using STR GO! Lysis Buffer with the Multidrop DW plate filler and Tecan 200 robot utilizing the STaCS test server.
- Optional: Independently, prepare a buccal lysis plate using Prep-n-Go Buffer with the Multidrop DW plate filler and Tecan 200 robot utilizing the STaCS test server.
## CO-TM-ROBOT-07 BSD-600 Operation

<table>
<thead>
<tr>
<th>Required Readings</th>
<th>Trainer Initials</th>
<th>Date Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ CO-03-12 Investigator 24plex GO! Amplification. CODIS SOP. Texas DPS Crime Laboratory</td>
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<tr>
<td>□ Optional: CO-03-09 Identifier Direct Amplification. CODIS SOP. Texas DPS Crime Laboratory</td>
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<tr>
<td>□ BSD-600 Duet Semi-Automated Dried Sample Punch Instrument Operator Guidelines</td>
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<td></td>
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<tr>
<td>□ Qiagen. Investigator 24plex GO! Handbook</td>
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</table>

### Observed Performance

- Discuss and observe the Plate Create, Plate Preparation, and Punch modules in STaCS.
- Discuss and observe the operation of the BSD 600.
- Observe the trainer amplify a plate of known samples with the Investigator 24plex GO! kit using the Tecan EVO 100 and the BSD-600. The exercise will utilize the STaCS test server.
- Optional: Observe the trainer amplify a plate of known samples with the Identifier Direct kit using the Tecan EVO 100 and the BSD-600. The exercise will utilize the STaCS test server.

### Supervised Performance

- Under the supervision of the trainer, amplify a plate of known samples with the Investigator 24plex GO! kit using the Tecan EVO 100 and the BSD-600. The exercise will utilize the STaCS test server.
- Optional: Under the supervision of the trainer, amplify a plate of known samples with the Identifier Direct kit using the Tecan EVO 100 and the BSD-600. The exercise will utilize the STaCS test server.

### Assessment

- Optional: Written Examination
- Independently amplify a plate of known samples with the Investigator 24plex GO! kit using the Tecan EVO100 robot and the BSD-600 utilizing the STaCS test server...
- Optional: Independently amplify a plate of known samples with the Identifier Direct kit using the Tecan EVO100 robot and the BSD-600 utilizing the STaCS test server...

## CO-TM-ROBOT-08 QIAsymphony SP Extraction

<table>
<thead>
<tr>
<th>Required Reading</th>
<th>Trainer Initials</th>
<th>Date Completed</th>
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</thead>
<tbody>
<tr>
<td>□ CO-03-11 QIAsymphony SP Extraction. CODIS SOP. Texas DPS Crime Laboratory</td>
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<tr>
<td>□ Qiagen. QIAsymphony SP User Manual</td>
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</table>

### Activities

- Trainee will extract at least two blood and two buccal samples using the QIAsymphony

### Assessment

- Optional: Written Examination

### Specialized Courses

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<th>Date Completed</th>
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