



**WASHINGTON STATE PATROL
CRIME LABORATORY DIVISION**

BIOCHEMICAL ANALYSIS TRAINING PROGRAM MANUAL

July 2016

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1.0 MODULE 1 – INTRODUCTION

Estimated completion time – 2 days

Welcome to the Washington State Patrol Crime Laboratory Division (WSP CLD). This training manual is intended for candidates who have been successful in obtaining employment in a DNA Unit or for existing staff who are training in Biochemical Analysis within the WSP CLD.

1.1 GOAL

Depending on the new employee's prior education, experience, and background, demonstration of competency in each of the major areas of this training manual may be all that is required to complete many of the modules.

At the end of this module, the trainees should be able to:

1. Understand the expectations of the training program.
2. Understand the general operation of the laboratory, including:
3. Orientation to laboratory facility
4. Organizational structure, code of ethics, and chain of command
5. Security and confidentiality
6. Quality Assurance and Quality Control

1.2 GENERAL INFORMATION AND STRUCTURE OF TRAINING

The Biochemical Analysis Training Program Manual is to guide the trainee to become sufficiently knowledgeable and proficient in Biochemical analysis to perform the role for which they have been employed. Each trainee will be assigned a primary trainer to oversee the training plan. This primary trainer will be designated by the trainee's supervisor.

The primary trainer shall provide the trainee with the necessary instruction and reading materials to complete each training module. The trainee should get instruction from a variety of secondary trainers. This may include receiving training from scientists at other WSP Crime Laboratories or from other external training agencies. The primary trainer, if other than the FS4 Technical Lead will consult with the FS4 Technical Lead to plan, schedule, and report the progress of each trainee's program. In turn the FS4 Technical Lead will keep the DNA Technical Leader and trainee's supervisor up to date on the progress of the training plan.

An overview of forensic biology is recommended. This should include some history of the methods used and the general case approach through court presentation. The method of instruction will include reading, lectures, discussions, demonstrations, and observations. The trainee should be given an opportunity to observe court testimonies of other forensic scientists.

At the conclusion of each module the primary trainer will assess the trainee's depth of understanding of the material covered through communications with secondary trainers, discussions with the trainee, written or oral examinations and competency tests. Alternatively a single test and/or competency can be used to cover multiple modules.

Refer to the CLD Quality Manual, Section 7, for further specifications on competency testing.

After each module is completed, the primary trainer will document that the trainee is qualified in that section. An IOC will be prepared by the Laboratory Forensic Scientist 5, addressed to the Crime Laboratory Manager and forwarded thru the appropriate chain of command to the Division Manager upon the employee's successful completion of various phases (e.g., blood, semen identification) in the Biochemical Analysis Training Program. The approval documentation shall also include the DNA Technical Leader. Alternatively, one IOC can be written at the completion of all modules.

Once all members of the appropriate chain of command have signed the IOC, the trainee's supervisor will make arrangements for the trainee to initially perform supervised casework with experienced, qualified forensic scientists for a period of time to be determined by the supervisor. At the end of the training period, the effectiveness of the training actions shall be evaluated and documented.

The trainee shall keep a training record, which shall include at minimum: notes from the discussions and summary discussions, any supplemental practical exercises or readings, the results of competency tests, and documentation of court observations.

1.3 READING ASSIGNMENTS

1.3.1 WSP QUALITY MANUAL

1.3.2 WSP CLD OPERATIONS MANUAL

1.3.3 DNA QUALITY ASSURANCE MANUAL

1.4 ASSESSMENT

This module will be completed by all new employees. The material should also be reviewed by experienced staff training in this area to ensure their knowledge is current.

No practical exam is provided for this module. The trainer will assess through discussion the trainee's knowledge of the subject areas as per the goals stated above and document using the trainer's evaluation form.

At the end of this module, the trainee should be able to:

1. Understand the expectations of the training program.
2. Understand the general operation of the laboratory.

2.0 MODULE 2 – SAFETY

Estimated completion time – 1 day

2.1 GOAL

The purpose of this module is to familiarize the trainee with general safety precautions and procedures throughout the laboratory. Additional detailed safety precautions (e.g., specific chemical safety) will also be addressed in the applicable section(s) of the Biochemistry Procedures Manual.

At the end of this module, the trainee will be able to:

1. Understand general laboratory safety procedures.
2. Successfully explain the safety precautions that should be taken when handling biological evidence.

2.2 TASKS

Instruction/demonstration/practical training will be provided:

2.2.1 GENERAL LABORATORY SAFETY TOPICS:

1. Fire Evacuation Plan
2. Earthquake Evacuation Plan
3. Use of the following emergency equipment:
 - a. First aid kit
 - b. Eye wash
 - c. Emergency shower
 - d. Fire blanket (if applicable)
 - e. Fire extinguisher
4. Use and cleaning of glassware and other equipment
5. Use of electrical equipment

2.2.2 PERSONAL PROTECTIVE EQUIPMENT (PPE):

1. Gloves
2. Laboratory coat (general wear vs. PCR dedicated)
3. Eye wear
4. Face masks
5. Disposable sleeves
6. Plastic shield
7. Chemical fume hood
8. Biological Safety Cabinet

2.2.3 CHEMICAL SAFETY TOPICS:

1. Material Safety Data Sheets (MSDS)
2. Universal safety measures for use of acids and bases.
3. Universal safety measures for use of carcinogenic and toxic materials.
4. Overview of hazards associated with specific chemicals used in reagents.
5. Chemical storage.
6. Spill Kits

2.2.4 BIOHAZARD SAFETY:

Instruction will be provided on precautions against transmission of the following infectious diseases during Evidence handling, and availability of vaccines (if applicable):

1. Hepatitis (Vaccine available for HVB)
2. HIV
3. Tuberculosis

Instruction and practical training will be provided on proper handling of liquid and/or wet samples (e.g., liquid blood)

Instruction will be provided on proper procedures to be used in the event of a biohazard spill (e.g., use of 10% bleach solution)

2.2.5 HAZARDOUS WASTE MATERIALS AND OTHER LAB GENERATED WASTE:

1. Chemical
2. Biological
3. Sharps

2.3 READING ASSIGNMENTS

2.3.1 WSP CLD SAFETY MANUAL

2.3.2 EMERGENCY PREPAREDNESS PLAN (LAB-SPECIFIC)

2.4 ASSESSMENT

This module will be completed by all new employees for Biochemistry analysis. The material should also be reviewed by experienced staff training in this area to ensure that their familiarity with safety equipment and procedures is current. No practical exam or competency is provided for this module. The trainer will assess through discussion the trainee's knowledge of the subject areas as per the goals stated above and document using the trainer's evaluation form.

3.0 MODULE 3 – EVIDENCE HANDLING AND PRESERVATION

Estimated completion time – 2 days

3.1 GOAL

The purpose of this module is to familiarize the trainee with procedures to preserve the integrity of the evidentiary value of submitted items as well as maintaining a documented chain of custody.

At the end of this module, the trainee should be able to successfully:

1. Describe the precautions that would be taken when handling and preserving evidence within the DNA section and shared between any of the following sections: Biochemistry/DNA, Trace Evidence, Chemistry, Firearms, Toxicology, Questioned Documents, Latent Fingerprints, and Crime Scene Reconstruction.
2. Explain the administrative process for evidence receipt and maintaining Chain of Custody.

3.2 TASKS

Instruction/demonstration/practical training will be provided in the following areas:

3.2.1 STORAGE OF BIOLOGICAL EVIDENCE AND PREVENTATIVE STEPS TO MINIMIZE DEGRADATION

1. Refrigeration of liquid blood
2. Preparation and storage of dried reference bloodstains
3. Body fluid stains - dried and frozen (including special circumstances such as knives, rocks, etc.)
4. Sexual assault evidence - dried and frozen
5. Other biological evidence (e.g., hairs, condoms, etc.)

3.2.2 MAINTAINING THE CHAIN OF CUSTODY

1. LIMS
2. RFLE completion
3. Accepting and releasing evidence
4. Creating a new item of evidence
5. Marking and sealing evidence
6. Evidence retained in the laboratory
7. Interlab evidence transfers
8. Discrepancies on RFLE

3.2.3 PRESERVATION OF EVIDENTIARY VALUE OF ITEMS SHARED BETWEEN SECTIONS

1. Using magnification to identify evidence (stereomicroscope and compound microscope)
2. Collection of trace evidence
3. Note taking and documentation; use of visual documentation as applicable (e.g., sketches, digital camera, scanner)

3.2.4 CONSERVATION OF SAMPLE

1. Stain collection and substrate control collection
2. Sample collection using the M-Vac[®] System (if applicable for the laboratory)
3. Saving half the sample
4. Letter of consent to consume a sample

3.2.5 EVIDENCE STORAGE DURING ANALYSIS

1. Temperature of storage during analysis
2. Items stored at laboratory

3.3 READING ASSIGNMENTS

3.3.1 WSP FORENSIC SERVICES GUIDE

3.3.2 SELECTED PORTIONS OF THE LIMS MANUAL

3.3.3 SEC SERIES 100 AND 150 USER GUIDE, BY MSI M-VAC SYSTEMS[®], INC. (IF APPLICABLE)3.3.4 WASHINGTON STATE PATROL INTERNAL VALIDATION OF THE M-VAC[®] SYSTEM (IF APPLICABLE)**3.4 ASSESSMENT**

No practical exam or competency is provided for this module. The trainer will assess through discussion the trainee's knowledge of the subject areas as per the goals stated above and document using the trainer's evaluation form.

4.0 MODULE 4 – EVIDENCE EXAMINATION

Estimated completion time – 1 week

4.1 GOAL

The purpose of this module is to familiarize the trainee with the general principles and standard practices of examining evidence for the presence of biological material and other types of evidence.

At the end of this module, the trainee should be able to successfully:

1. Determine the relevance of an examination given characteristics of the evidence itself and any supporting documentation.
2. Recognize and minimize any potential for evidence to be compromised during examination.
3. Adopt standards of case management and documentation of examinations.

4.2 TASKS

Instruction, demonstration, and practical training will be provided in the following areas:

4.2.1 CLEANLINESS OF WORK AREA AND EXAMINATION TOOLS

4.2.2 RELEVANCE OF EXAMINATIONS

4.2.3 DOCUMENTATION OF EXAMINATIONS

1. Note taking
2. Digital photos
3. Sketches

4.2.4 PRESERVING THE INTEGRITY OF THE EVIDENCE (CONTAMINATION/LOSS PREVENTION)

4.2.5 THOROUGHNESS OF EXAMINATIONS

4.2.6 CASEWORK APPROACH

4.2.7 SAFETY

4.3 READING ASSIGNMENTS

4.3.1 WSP BIOCHEMICAL ANALYSIS PROCEDURES

4.4 ASSESSMENT

No practical exam or competency is provided for this module. The trainer will assess through discussion the trainee's knowledge of the subject areas as per the goals stated above and document using the trainer's evaluation form.

5.0 MODULE 5 – FORENSIC/ALTERNATE LIGHT SOURCE

Estimated completion time – 3 days

5.1 GOAL

The purpose of this module is to familiarize the trainee with the proper use of the Forensic/Alternate Light Source (FLS or ALS) for examining evidence for the presence of biological material.

At the end of this session, the trainee should be able to operate the ALS safely to locate possible biological material.

5.2 TASKS

Instruction/demonstration/practical training will be provided in the following areas:

- 5.2.1 SAFETY OF OPERATION OF THE ALS
- 5.2.2 APPROPRIATE WAVELENGTHS AND FILTERS
- 5.2.3 PROCEDURE FOR EXAMINATION OF EVIDENCE
- 5.2.4 MATERIALS THAT FLUORESCENCE
- 5.2.5 DOCUMENTATION OF EXAMINATION
- 5.2.6 INTERPRETATION AND CONCLUSIONS

5.3 READING ASSIGNMENTS

- 5.3.1 WSP Biochemical Analysis Procedures
- 5.3.2 User's Manual for ALS (lab specific)

5.4 ASSESSMENT

PRACTICAL: Examination of a variety of both known and unknown materials from biological, chemical, and physical sources, to familiarize the trainee with a range of materials that may be encountered in casework. The substances should be examined on various substrates.

No competency exam is provided for this module. The trainer will assess through discussion the trainee's knowledge of the subject areas as per the goals stated above and document using the trainer's evaluation form.

6.0 MODULE 6 – IDENTIFICATION OF BLOOD

Estimated completion time –1 week

6.1 GOAL

The purpose of this module is to familiarize the trainee with accepted protocols for the presumptive and confirmatory testing for the presence and identification of blood.

At the end of this module, the trainee should be able to successfully:

1. Test stains using proper procedures for Kastle Meyer (phenolphthalein), Hematrace, and Takayama (hemochromogen) tests.
2. Interpret test results and draw appropriate conclusions.
3. Be familiar with other presumptive testing methods.
4. Know the components of blood and their functions, and expected quantities of DNA found in a white blood cell.

6.2 TASKS

Instruction/demonstration/practical training will be provided in the following areas:

6.2.1 PHYSICAL AND CHEMICAL CHARACTERISTICS OF BLOOD:

1. Components of blood and their function
2. Visual appearance (gross)
3. Stereomicroscopic appearance
4. Effects of degradation and aging

6.2.2 REAGENT PREPARATION

1. Phenolphthalein
2. Stock and working solutions
3. Takayama reagent
4. Quality Control testing of reagents and documentation

6.2.3 PRESUMPTIVE TESTING

1. Phenolphthalein
 - a. Biochemical basis, procedure, and the value of a two-step test
 - b. Control samples
 - c. Potential false positives
 - d. Interpretation and conclusions
2. Other catalytic tests
 - a. Leucocrystal violet

- b. Tetramethyl Benzidine (TMB) (Hemastix[®])
- c. Ortho-Tolidine

3. Blood Enhancement

- a. Leukocrystal violet
- b. Luminol (and other luminescent reagents as available)

6.2.4 CONFIRMATORY TESTING

1. Takayama microcrystalline test

- a. Biochemical basis and procedure
- b. Control samples
- c. Interpretation and conclusions

2. Abacus OneStep Hematrace[®] Cards

- a. Biochemical basis and procedure
- b. High dose hook effect
- c. Specificity and sensitivity
- d. Interpretation and conclusions

6.2.5 EFFECTS OF PRESUMPTIVE AND CONFIRMATORY REAGENTS ON ADDITIONAL (E.G., STR) TESTING

6.2.6 DOCUMENTATION

6.3 **READING ASSIGNMENTS**

- 6.3.1 Abacus Hematrace[®] package insert.
- 6.3.2 Blake and Dillon, "Microorganisms and the Presumptive Tests for Blood," J. of Political Science Administration, Vol. 1, #4, Dec. 1973.
- 6.3.3 Cox, M., "Effect of Fabric Washing on the Presumptive Identification of Bloodstains", J. For Sci., Vol. 35, #6, November 1990, pp. 1335-1341.
- 6.3.4 Cox, M. "A Study of the Sensitivity and Specificity of Four Presumptive Tests for Blood", J. For. Sci., Vol. 36, #5, September 1991, pp. 1503-1511.
- 6.3.5 Culliford BJ. In: The Examination and Typing of Bloodstains in the Crime Laboratory. U.S. Department of Justice, Law Enforcement Assistance Administration; 1971; (Phenolphthalein).
- 6.3.6 Gaensslen, R.E. 1983. Sourcebook in Forensic Serology, Immunology and Biochemistry. Washington, D.C. U.S. Department of Justice. 85-87, 101-116.
- 6.3.7 Lee HC. Identification and Grouping of Bloodstain. In: Saferstein (ed.), Forensic Science Handbook. Englewood Cliffs: Prentice Hall; 1982; 272-279.
- 6.3.8 Lehninger AL. Biochemistry. 2nd Ed. New York: Worth Publishers; 1975. (blood)

- 6.3.9 Higaki RS & Philp WM. A Study of the Sensitivity, Stability and Specificity of Phenolphthalein as an Indicator for blood. *Can. Soc. For. Sci J.* 1971;9(3):97-102.
- 6.3.10 Hochmeister MN. Validation studies of an immunochromatographic 1-step test for the forensic identification of human Blood. *Journal of Forensic Sciences* 1999;44(3):597-602.
- 6.3.11 Metropolitan Police Forensic Science Laboratory. *Biology Methods Manual*. London: Commissioner of Police of the Metropolis; 1978: pages 2-88 to 2-91.
- 6.3.12 Rowley B. Commentary on Hochmeister, MN. "Validation studies of an immunochromatographic 1-step test for the forensic identification of human blood." *Journal of Forensic Sciences* 1999;44(6):1323-4.
- 6.3.13 Serology Unit Protocol Manual. Washington D.C.: U.S. Department of Justice, FBI Laboratory 1989:2-3 to 2-4, 2-10 to 2-11.
- 6.3.14 Spalding RP, Cronin WF. *Technical and Legal Aspects of Forensic Serology: A Laboratory Manual*. Washington D.C.: U.S. Department of Justice, FBI, 1984.
- 6.3.15 WSP Biochemical Analysis Procedures

6.4 ASSESSMENT

PRACTICAL: Test samples of known blood, rust, plant material and materials reported in the literature to give false positive presumptive tests. Use various collection methods (i.e., moistened swab, filter paper, etc.). Test serum and whole blood. Prepare serial dilutions and laundered stains and test with phenolphthalin, Takayama, and Hematrace[®]. Prepare Takayama slides using aged blood.

COMPETENCY TESTING: A minimum of ten correctly characterized stains.

7.0 MODULE 7 – BLOODSTAIN PATTERN INTERPRETATION

Estimated completion time – 2 days

7.1 GOAL

The purpose of this module is to familiarize the trainee with typical bloodstain patterns encountered in casework. This will not result in the trainee becoming proficient in bloodstain pattern analysis. However, the expectation is that they will be able to recognize when this analysis may be necessary.

7.2 TASKS

Instruction/demonstration/practical training will be provided in the following areas:

1. Theory
2. Recognition of bloodstain patterns
3. Documentation of bloodstain patterns
4. Descriptive vocabulary

7.3 READING ASSIGNMENTS

- 7.3.1 Bevel and Gardner, Bloodstain Pattern Analysis, Chapters 1-3, 5, 10, 11, 13.

7.4 ASSESSMENT

PRACTICAL: Use liquid human blood (if possible) to create bloodstain patterns (e.g., dripping, contact transfer). Examine blood drops on various substrates, dropped from various angles, and in varying amounts.

COMPETENCY: None.

8.0 MODULE 8 – SPECIES OF ORIGIN

Estimated completion time – 3 days

8.1 GOAL

The purpose of this module is to familiarize the trainee with the theory behind species of origin identification and to educate them with some of the tests available to accomplish that task

At the end of this module, the trainee should be able to successfully:

1. Explain the purpose of a species of origin test.
2. Describe the biochemistry behind species identification testing.
3. Describe the tests performed by the WSP Crime Lab.
4. Test biological stains to determine species of origin (as permitted by laboratory resources)

8.2 TASKS

Instruction, demonstration, and practical training will be provided in the following areas (laboratory resources may limit the practical portion of the instruction however the theory will still be explained).

8.2.1 BIOCHEMISTRY

1. Antibody formation
2. Antibody-Antigen reaction
3. Preparation of antisera
4. The occurrence of cross-reactivity

8.2.2 OUCHTERLONY DOUBLE-DIFFUSION

8.2.3 USE OF CONTROLS

8.2.4 COOMASSIE STAINING

8.2.5 INTERPRETATION OF PRECIPITATION PATTERNS AND CONCLUSIONS

8.2.6 SPECIES SPECIFICITY OF DNA MARKERS

8.2.7 DOCUMENTATION OF RESULTS

8.3 READING ASSIGNMENTS

8.3.1 Brown, Barry L. and Baechtel, F. Samuel, "Application of Immunologic Methods to Forensic Science", Crime Laboratory Digest, Vol. 11, #1, January 1984.

8.3.2 Culliford B.J. In: The Examination and Typing of Bloodstains in the Crime Laboratory. U.S. Department of Justice, Law Enforcement Assistance

Administration; 1971; (Species).

- 8.3.3 Lee HC. Identification and Grouping of Bloodstain. In: Forensic Science Handbook. Saferstein (ed.). Englewood Cliffs: Prentice Hall; 1982; 283-287.
- 8.3.4 Metropolitan Police Forensic Science Laboratory. Biology Methods Manual. London: Commissioner of Police of the Metropolis; 1978: pages 2-93 to 2-94.
- 8.3.5 Sensabaugh, G.F., "Molecular Evolution and the Immunological Determination of Species", Int. Microform J. of Legal Medicine, Vol. 11, #2, 1976.
- 8.3.6 Gaensslen, R.E. 1983. Sourcebook in Forensic Serology, Immunology and Biochemistry. Washington, D.C. U.S. Department of Justice. 221-241.
- 8.3.7 WSP Biochemical Analysis Procedures

8.4 ASSESSMENT

PRACTICAL: Extract samples of known human and non-human bloodstains with various extractants (ammonia, DTT, PBS, water), make various dilutions (to test sensitivity) and run Ouchterlony.

COMPETENCY TESTING: Six to twelve correctly identified samples (depending upon laboratory resources, as determined by trainer[s]).

9.0 MODULE 9 – IDENTIFICATION OF SEMEN

Estimated completion time – 2 weeks

9.1 GOAL

The purpose of this module is to familiarize the trainee with the accepted protocols for the presumptive and confirmatory identification of semen.

At the end of this module, the trainee should be able to successfully:

1. Describe the physical and chemical characteristics of semen and the morphology of spermatozoa.
2. Test evidence items either directly or with a mapping technique to determine the location of possible semen stains by detecting acid phosphatase.
3. Produce a cell pellet, prepare a slide, stain the slide and positively identify spermatozoa under a microscope. Characterize other material that may be present on the slide.
4. Identify semen with the use of a p30 card.

9.2 TASKS

Instruction, demonstration, and practical training will be provided in the following areas:

9.2.1 PHYSICAL AND CHEMICAL CHARACTERISTICS OF SEMEN

1. Components of semen
2. Spermatazoa morphology
3. Typical volume of ejaculate
4. Typical number of spermatozoa per volume
5. Azoospermia
6. Persistence of semen

9.2.2 ACID PHOSPHATASE

1. Reagent Preparation
2. Quality Control testing of reagents and documentation
3. Mapping
4. Sample swabbing and/or evidence swab testing
5. Controls
6. Biochemistry of reaction; time to color development
7. Interpretation and conclusions
8. False positives

9.2.3 IDENTIFICATION OF SPERMATOZOA AND SAMPLE EXTRACTION

1. Cell pellet preparation
2. Slide preparation
3. Christmas Tree staining; Reagent preparation (if appropriate)
4. Sperm search; tails vs. no tails
5. Sperm identification and epithelial cell identification; familiarity with commonly encountered objects (e.g., bacteria, yeast, lubricant, etc.)
6. Interpretation and conclusions

9.2.4 P30 PROTEIN

1. Abacus OneStep p30 cards; biochemistry of reaction
 - a. Sample preparation
 - b. Controls
 - c. Specificity and sensitivity
 - d. High-dose hook effect
 - e. False positives
 - f. Interpretation and conclusions
2. Rocket and Crossover electrophoresis (optional and for discussion only)

9.2.5 DOCUMENTATION

1. Slide deposition (positive slides returned)
2. Sperm search observations (including p30 and AP)
3. Documentation of controls

9.3 **READING ASSIGNMENTS**

- 9.3.1 Abacus OneStep p30 card product insert.
- 9.3.2 Allard JE. The collection of data from finding in cases of sexual assault and the significance of spermatozoa on vaginal, anal, and oral swabs. *Science and Justice* 1997;37(2):99-108.
- 9.3.3 Baechtel F. The Identification and Individualization of Semen Stains. In: Saferstein (ed.), *Forensic Science Handbook*, vol. 2. Englewood Cliffs: Prentice Hall; 1988: 347-68.
- 9.3.4 Blake and Sensabaugh, "Genetic Markers in Human Semen: A Review", *J. of Science*, Vol. 21, #4 Oct. 1976, pp. 784-796.
- 9.3.5 Brauner and Gallili, "A Condom-the Critical Link in a Rape", *J. For. Sci.*, Vol. 38, #5, September 1993, pp. 1233-1236.
- 9.3.6 Bryson, Garlo and Piner, "Vaginal Swabs: "Endogenous and Postcoital Components", *J. For.Sci.*, Vol. 29, No. 3, pp. 157-171.

- 9.3.7 Davis and Wilson, "The Persistence of Seminal Constituents in the Human Vagina, For. Sci., Vol. 3, pp. 45-55.
- 9.3.8 Denison SJ. Positive prostate-specific antigen (PSA) results in semen-free samples. Canadian Society of Forensic Science Journal 2004; 37(4):197-206.
- 9.3.9 Enos WF, Beyer JC. Sperm in the Anal Canal and Rectum and in the Oral Cavity of Female Rape Victims. Journal of Forensic Sciences 1978; 23(1):231-233.
- 9.3.10 Gaensslen, R.E. 1983. Sourcebook in Forensic Serology, Immunology and Biochemistry. Washington, D.C. U.S. Department of Justice. 155-69.
- 9.3.11 Graves, Sensabaugh and Blake, "Postcoital Detection of a Male Specific Semen Protein", New England Journal of Medicine, Vol. 312, No. 6, pp. 338-343.
- 9.3.12 Hochmeister et. al., "Evaluation of Prostate-specific Antigen (PSA) Membrane Test Assays for the Forensic Identification of Seminal Fluid", J. For. Sci., Vol. 44, #5, September 1999, pp. 1057-1060.
- 9.3.13 Joshi et. al., "Effect of Water Immersion on Seminal Stains on Cotton Cloth", For. Sci. Inter., Vol. 17, #1, January-February 1981, pp. 9-11.
- 9.3.14 Kafarowshi et. al., "The Retention and Transfer of Spermatozoa in Clothing by Washing Machine", Canadian Society of Forensic Science Journal, Vol. 29, #1, 1996, pp. 7-11.
- 9.3.15 Metropolitan Police Forensic Science Laboratory. Biology Methods Manual. London: Commissioner of Police of the Metropolis; 1978: pages 3-16 to 3-33.
- 9.3.16 Oppitz E. A new color method for proof of sperm in moral crimes. Arkiv Fur Krimin 1969; 144:145-8.
- 9.3.17 Sensabaugh, G.F., "Isolation and Characterization of a Semen-Specific Protein from Human Seminal Plasma: A Potential New Marker for Semen Identification", J. For. Sci., Vol. 23, pp. 106-115.
- 9.3.18 Serological Research Institute. "A Gram Modified Christmas Tree Stain." In: Serological Research Institute Methods Manual. Doc. MM II-C, rev. 2; 2002; 1-2.
- 9.3.19 Serological Research Institute. "The Brentamine Reaction." In: Serological Research Institute Methods Manual. Doc. MM I-B, rev. 2; 2002: 1-3.
- 9.3.20 Stubbings and Newell, "An Evaluation of Gamma-Glutamyl Transpeptidase (GGT) and p30 Determinations for the Identification of Semen on Postcoital Vaginal Swabs", J. For. Sci., Vol. 30, #3, July 1985, pp. 604-614.
- 9.3.21 Willott GM, Allard JE. Spermatozoa – Their Persistence After Sexual Intercourse. Forensic Science International 1982; 19(2):135-154.
- 9.3.22 WSP Biochemical Analysis Procedures
- 9.3.23 Sippel, H, Lunetta, L., Positive prostate-specific antigen (PSA) reaction in rectal

samples from deceased males. Promega International Symposium on Human Identification, October 2004.

9.4 ASSESSMENT

PRACTICAL: Test a variety of substrates (clothing and swabs) with a variety of stains (e.g., semen, urine, vaginal secretions, etc) using a combination of ALS, acid phosphatase reagent (spot test and mapping), microscopic examination for sperm, and Abacus OneStep p30 cards, as appropriate. Use different dilutions and mixtures of body fluids in the above testing. A minimum of five satisfactory Christmas tree stained slides must be prepared from mixed body fluids (e.g., semen/vaginal secretions, semen/saliva, etc. at various dilutions). Examine slides from various species to compare and contrast spermatozoa morphology.

COMPETENCY TESTING: A minimum of ten correctly characterized samples (semen, saliva, or mixtures of body fluids).

10.0 MODULE 10 – AMYLASE SCREENING

Estimated completion time – 1 week

10.1 GOAL

The purpose of this module is to familiarize the trainee with accepted protocols used to determine the presence of amylase, an enzyme found in elevated levels in saliva.

At the end of this module the trainee should be able to successfully:

1. Test stains using proper procedures for Rapid Stain Identification (RSID)[™] cards and Phadebas[®] paper.
2. Interpret test results and draw appropriate conclusions.

10.2 TASKS

Instruction, demonstration, and practical training will be provided in the following areas:

10.2.1 RELEVANCE OF EXAMINATION IN CASEWORK

10.2.2 EXAMINATION APPROACH

1. ALS.
2. Amylase mapping.
3. Swabbing.
4. Sampling

10.2.3 REAGENT PREPARATION

10.2.4 RSID[™] CARDS

1. Biochemical basis and procedure.
2. Potential false positives.
3. Interpretation and conclusions

10.2.5 PHADEBAS[®] PAPER

1. Biochemical basis and procedure.
2. Potential false positives.
3. Interpretation and conclusions

10.2.6 DOCUMENTATION**10.3 READING ASSIGNMENTS**

- 10.3.1 Auvdel, M.J., "Amylase Levels in Semen and Saliva Stains", J. For. Sci, Vol. 31, #2, April 1986, pp. 426-431.
- 10.3.2 Gaensslen, R.E. 1983. Sourcebook in Forensic Serology, Immunology and Biochemistry. Washington, D.C. U.S. Department of Justice. 184-189.
- 10.3.3 Keating and Higgs, "The Detection of Amylase on Swabs from Sexual Assault Cases", J. For. Sci. Society, Vol. 34, #2, April-June 1994, pp. 89-93.
- 10.3.4 Lathia D, Brendebach M. Influence of thiocyanate ions of starch-iodine reaction used for the estimation of a amylase activity. Clinica Chimica Acta 1978; 82(3):209-14.
- 10.3.5 Metropolitan Police Forensic Science Laboratory. Biology Methods Manual. London: Commissioner of Police of the Metropolis; 1978: pages 3-9 to 3-16.
- 10.3.6 Nelson DF, Kirk PL. The identification of saliva. Journal of Forensic Medicine 1963; 10(1):14-20.
- 10.3.7 Phadebas[®] product insert.
- 10.3.8 Rapid Stain IDentificationTM (semen) product insert.
- 10.3.9 Schill WB, Schumacher GF. Radial diffusion in gel for micro determination of enzymes. I. Muramidase, alph-amylase, DNase I, RNase A, acid phosphatase, and alkaline phosphatase. Analytical Biochemistry 1972; 46(2):502-33.
- 10.3.10 Sweet, et. al. "An Improved Method to Recover Saliva from Human Skin: The Double Swab Technique", J. For. Sci., Vol. 42, #2, March 1997, pp. 320-322.
- 10.3.11 Sweet and Shutler, "Analysis of Salivary DNA Evidence from a Bite Mark on a Body Submerged in Water" J. For. Sci., Vol. 44, #5, September 1999, pp. 1069-1072.
- 10.3.12 Stiefel DJ, Keller PJ. Preparation and some properties of human pancreatic amylase including a comparison with human parotid amylase. Biochem Biophys Acta 1973; 302(2):345-61.
- 10.3.13 Willot GM. An improved test for the detection of salivary amylase in stains. Journal of the Forensic Science Society 1974; 14(4):341-4.
- 10.3.14 Willot GM, Griffiths M. A new method for locating saliva stains – spotty paper for spotting spit. Forensic Science International 1980; 15(1):79-83.
- 10.3.15 Meyers, J.R. and Adkins, W.K. "Comparison of Modern Screening Techniques for Saliva Screening" J. For. Sci., Vol. 53, #4, July 2008, pp. 862-867.
- 10.3.16 WSP Biochemical Analysis Procedures

10.3.17 Ricci, Ugo, et.al. "False-Positive Results with Amylase Testing of Citrus Fruits", J. For. Sci., Vol.59, No. 5, September 2014, pp 1410-1412.

10.4 ASSESSMENT

PRACTICAL: Use ALS amylase mapping to identify potential saliva stains. Using RSID™ and Phadebas® paper, test neat saliva, a 1:100 dilution of saliva, and a potential false positive.

COMPETENCY: A minimum of five correctly characterized stains (using a combination of methods).

11.0 MODULE 11 – URINE AND FECES IDENTIFICATION

Estimated completion time – 1 week

11.1 GOAL

The purpose of this module is to familiarize the trainee with the accepted protocols for presumptive testing for urine and fecal material.

At the end of this module, the trainee should be able to successfully:

1. Describe the physiological basis of testing for THP and urea as presumptive indicators for the presence of urine.
2. Describe the physiological basis of testing for urobilinogen and by microscopic examination as presumptive indicators for the presence of fecal material.
3. Test biological stains for THP and urea as presumptive indicators for the presence of urine.
4. Test biological stains for urobilinogen and by microscopic examination as presumptive indicators for the presence of fecal material.

11.2 TASKS

Instruction, demonstration, and practical training will be provided in the following areas:

11.2.1 PRESUMPTIVE URINE TESTING:

1. Physical characteristics of urine (odor and pH)
2. Testing for presence of Tamm-Horsfall protein (THP)
 - a. Physiology of THP
 - b. Biochemical basis and procedure
 - c. Interpretation and conclusions
3. Testing for presence of urea by radial diffusion
 - a. Physiology of urea and relative levels in other body fluids
 - b. Biochemical basis of radial diffusion test
 - c. Reagent preparation
 - d. Preparation of sample
 - e. Interpretation and conclusions
4. Documentation

11.2.2 PRESUMPTIVE FECAL MATERIAL TESTING:

1. Physical characteristics of fecal material
2. Testing for presence of urobilinogen

- a. Physiology of urobilinogen and relative levels in other body fluids
 - b. Biochemical basis of urobilinogen test
 - c. Reagent preparation
 - d. Preparation of sample
 - e. Interpretation and conclusions
3. Testing for presence of microscopic elements
 - a. Physiology of fecal components
 - b. Preparation of sample
 - c. Interpretation and conclusions
 4. Testing for species of origin (discussion only)
 5. Documentation

11.3 READING ASSIGNMENTS

- 11.3.1 Bedrosian, Stolorow and Tahir, "Development of a Radial Gel Diffusion Technique for the Identification of Urea in Urine Stains", J. For. Sci, Vol. 29, #2, April 1984, pp. 601-606.
- 11.3.2 Gaensslen, R.E. 1983. Sourcebook in Forensic Serology, Immunology and Biochemistry. Washington, D.C. U.S. Department of Justice. 191-198.
- 11.3.3 Akutsu T, Watanabe K, Sakurada K. Specificity, sensitivity, and operability of RSID™-urine for forensic identification of urine: comparison with ELISA for Tamm-Horsfall protein. J Forensic Sci. 2012 Nov; 57:1570-3.
- 11.3.4 Metropolitan Police Forensic Science Laboratory. Biology Methods Manual. London: Commissioner of Police of the Metropolis. 1978; pages 4-1 to 4-8.
- 11.3.5 U.S. Department of Justice. Federal Bureau of Investigation Laboratory. Serology Unit Protocol Manual. 1989.
- 11.3.6 Independent Forensics, Developmental Validation of RSID™-Urine, <http://ifi-test.com/pdf/UrineValidation.pdf>
- 11.3.7 WSP Biochemical Analysis Procedures

11.4 ASSESSMENT

PRACTICAL: Test known urine and feces stains at neat concentration and various dilutions using the procedures outlined in the Biochemistry Procedures Manual. Also test stains of other body fluids at neat concentration.

COMPETENCY: The trainer will assess through discussion the trainee's knowledge of the subject areas as per the goals stated above and document using the trainer's evaluation form. A competency exam is required prior to using these methods in casework.

12.0 MODULE 12 – HAIR IDENTIFICATION AND EVALUATION

Estimated completion time – 1 day

12.1 GOAL

The purpose of this module is to teach the trainee how to identify and evaluate hairs and fibers.

At the end of this module the trainee should be able to successfully:

1. Differentiate between hairs and fibers using a stereomicroscope
2. Differentiate between human and animal hairs
3. Determine if a human hair has a root with tissue (or without) that is suitable for DNA analysis

12.2 TASKS

Instruction, demonstration, and practical training will be provided in the following areas by a qualified Microanalysis scientist:

1. Theory and relevance of examination in casework
2. Illumination methods and using the stereomicroscope
3. Examination of known fibers
4. Examination of known human head, pubic and body hairs
5. Examination of known animal hairs

12.3 READING ASSIGNMENTS

- 12.3.1 Chewning, D.D., Deaver, K.L., and Christensen A.M., Persistence of Fibers on Ski Masks During Transit and Processing, Forensic Science Communications, 2008: 10(3).
- 12.3.2 Dachs, J., McNaught, I.J., and Robertson, J., The Persistence of Human Scalp Hair on Clothing Fabrics, Forensic Science International, 2003: 138(1), pp. 27-36.
- 12.3.3 Exline, D., Frequency of Pubic Hair Transfer During Sexual Intercourse, J Forensic Sci., 1998: 43, pp 505-508.
- 12.3.4 Linch, C.A., Smith, S.L., and Prahlow, J.A., Evaluation of the Human Hair Root for DNA Typing Subsequent to Microscopic Comparison, J. Forensic Sci., 1998: 43(2), pp. 305-314.
- 12.3.5 Linch, C.A., The Ultrastructure of Tissue Attached to Telogen Hair Roots, J Forensic Sci, 2008: 53(6), pp. 1363-1366.
- 12.3.6 Moore, T.D., Identification of Dorsal Guard Hairs of Some Mammals of Wyoming, Wyoming Game and Fish Department, 1974.
- 12.3.7 Ogle, R.R. and Fox, M.J., Atlas of Human Hair – Microscopic Characteristics, CRC

Press, 1999.

- 12.3.8 Pettenati, M.J. and Rao, P.N., Commentary on “Linch CA, Smith SL, Prahlow JA. Evaluation of the Human Hair Root for DNA Typing Subsequent to Microscopic Comparison. J Forensic Sci. 1998; 43(2):305–14”, J Forensic Sci. 1999; 44(6): pp. 1329-1330.

12.4 ASSESSMENT

PRACTICAL: Examine tape lifts from clothing and/or car seats, identifying hairs and fibers as appropriate.

COMPETENCY TESTING: A minimum of 10 correctly characterized and identified hairs or fibers. Hairs must be identified as human or animal and if there is a root suitable for DNA analysis.

MODULE 1 - TRAINER'S EVALUATION FORM

Introduction – Module 1

- 1. Expectations of the training program
- 2. Orientation to laboratory facility
- 3. Organizational structure, code of ethics, and chain of command
- 4. Security and confidentiality
- 5. Quality Assurance and Quality Control
- 6. The trainee has completed the above checked topics and is able to:
 - 1. Understand the expectations of the training program
 - 2. Explain the general operation of the laboratory

Comments:

Trainee	Date	Trainer or Reviewer	Date
Print Name + Initial		Print Name + Initial	

MODULE 2 - TRAINER'S EVALUATION FORM

Safety

1. General laboratory safety topics
2. Personal Protective Equipment (PPE)
3. Chemical safety topics
4. Biohazard safety
5. Hazardous waste materials and other lab generated waste
6. The trainee has completed the above checked sections and is able to
 1. Understand general laboratory safety procedures.
 2. Successfully explain the safety precautions that should be taken when handling biological evidence.

Comments:

Trainee	Date	Trainer or Reviewer	Date
Print Name + Initial		Print Name + Initial	

MODULE 3 - TRAINER'S EVALUATION FORM

Evidence Handling and Preservation

- 1. Storage of biological evidence and preventative steps to minimize degradation
- 2. Maintaining the Chain of Custody
- 3. Preservation of evidentiary value of items shared between sections †
- 4. Conservation of sample †
- 5. Evidence storage during analysis †
- 6. The trainee has completed the above checked sections and is able to:
 - 1. Describe the precautions that would be taken when handling and preserving evidence within the DNA section and shared between any of the following sections: Biochemistry/DNA, Trace Evidence, Chemistry, Firearms, Toxicology, Questioned Documents, Latent Fingerprints, and Crime Scene Reconstruction.
 - 2. Explain the administrative process for evidence receipt and maintaining Chain of Custody.

Comments:

Trainee	Date	Trainer or Reviewer	Date
Print Name + Initial		Print Name + Initial	

MODULE 4 - TRAINER'S EVALUATION FORM

Evidence Examination

- | | | |
|---|--------------------------|---|
| 1. Cleanliness of work area and examination tools | <input type="checkbox"/> | |
| 2. Relevance of examinations | <input type="checkbox"/> | † |
| 3. Documentation of examinations | <input type="checkbox"/> | |
| 4. Preserving the integrity of the evidence † | <input type="checkbox"/> | |
| 5. Thoroughness of examinations † | <input type="checkbox"/> | |
| 6. Casework Approach | <input type="checkbox"/> | † |
| 7. Safety † | <input type="checkbox"/> | |
| 8. The trainee has completed the above checked sections and is able to: | | |
| 1. Determine the relevancy of an examination given characteristics of the evidence itself and any supporting documentation. | | |
| 2. Recognize and minimize any potential for evidence to be compromised during examination. | | |
| 3. Adopt standards of case management and documentation of examinations. | | |

Comments:

Trainee	Date	Trainer or Reviewer	Date
Print Name + Initial		Print Name + Initial	

MODULE 5 - TRAINER'S EVALUATION FORM

Forensic Light Source/Alternate Light Source – Module 5

- | | | |
|--|--------------------------|---|
| 1. Safety of operation of the ALS | <input type="checkbox"/> | |
| 2. Appropriate wavelengths and filters | <input type="checkbox"/> | † |
| 3. Procedure for examination of evidence † | <input type="checkbox"/> | |
| 4. Materials that fluoresce † | <input type="checkbox"/> | |
| 5. Documentation of examination † | <input type="checkbox"/> | |
| 6. Interpretation and conclusions | <input type="checkbox"/> | |

At the end of this module, the trainee should be able to:

1. Operate the ALS to locate possible biological material on items similar to what would be encountered in casework.

Comments:

Trainee	Date	Trainer or Reviewer	Date
Print Name + Initial		Print Name + Initial	

MODULE 6 - TRAINER'S EVALUATION FORM

Identification of Blood – Module 6

- | | | |
|---|--|--------------------------|
| 1. Physical and chemical characteristics of blood | | <input type="checkbox"/> |
| 2. Reagent preparation † | | <input type="checkbox"/> |
| 3. Presumptive testing † | | <input type="checkbox"/> |
| 4. Confirmatory testing † | | <input type="checkbox"/> |
| 5. Effects of presumptive and confirmatory reagents on additional testing † | | <input type="checkbox"/> |
| 6. Documentation † | | <input type="checkbox"/> |
| 7. Competency: Minimum of ten correctly characterized stains † | | <input type="checkbox"/> |

At the end of this module, the trainee should be able to:

1. Test stains using proper procedures for phenolphthalein, Hematrace, and Takayama tests.
2. Interpret test results and draw appropriate conclusions.
3. Be familiar with other presumptive testing methods.
4. Know the components of blood and their functions, and expected quantities of DNA found in a white blood cell.

Comments:

Trainee	Date	Trainer or Reviewer	Date
Print Name + Initial		Print Name + Initial	

MODULE 7 - TRAINER'S EVALUATION FORM

Bloodstain Pattern Interpretation – Module 7

- | | | |
|----|--------------------------------------|--------------------------|
| 1. | Theory | <input type="checkbox"/> |
| 2. | Recognition of bloodstain patterns † | <input type="checkbox"/> |
| 3. | Documentation of bloodstain patterns | <input type="checkbox"/> |
| 4. | Descriptive vocabulary † | <input type="checkbox"/> |

At the end of this module, the trainee should be familiar with typical bloodstain patterns encountered in casework and be able to recognize when this analysis may be necessary.

Comments:

Trainee	Date	Trainer or Reviewer	Date
Print Name + Initial		Print Name + Initial	

MODULE 8 - TRAINER'S EVALUATION FORM

Species of Origin – Module 8

- | | | | |
|----|--|---|--------------------------|
| 1. | Biochemistry | † | <input type="checkbox"/> |
| 2. | Ouchterlony Double-Diffusion | | <input type="checkbox"/> |
| 3. | Use of controls | † | <input type="checkbox"/> |
| 4. | Coomassie staining | † | <input type="checkbox"/> |
| 5. | Interpretation of precipitation patterns and conclusions | † | <input type="checkbox"/> |
| 6. | Species specificity of DNA markers | † | <input type="checkbox"/> |
| 7. | Documentation of results | † | <input type="checkbox"/> |
| 8. | Competency: Minimum of six correctly identified samples | † | <input type="checkbox"/> |

At the end of this module, the trainee should be able to:

1. Explain the purpose of a species of origin test.
2. Describe the biochemistry behind species identification testing.
3. Describe the tests performed by the WSP Crime Lab.
4. Test biological stains to determine species of origin.

Comments:

Trainee	Date	Trainer or Reviewer	Date
Print Name + Initial		Print Name + Initial	

MODULE 9 - TRAINER'S EVALUATION FORM

Identification of Semen – Module 9

- | | |
|---|--------------------------|
| 1. Physical and chemical characteristics of semen | <input type="checkbox"/> |
| 2. Acid Phosphatase † | <input type="checkbox"/> |
| 3. Identification of spermatozoa and sample extraction † | <input type="checkbox"/> |
| 4. p30 protein † | <input type="checkbox"/> |
| 5. Documentation † | <input type="checkbox"/> |
| 6. Competency: Minimum of ten correctly characterized samples † | <input type="checkbox"/> |

At the end of this module, the trainee should be able to:

1. Describe the physical and chemical characteristics of semen and the morphology of spermatozoa.
2. Test evidence items either directly or with a mapping technique to determine the location of possible semen stains by detecting acid phosphatase.
3. Produce a cell pellet, prepare a slide, stain the slide and positively identify spermatozoa under a microscope. Characterize other material that may be present on the slide.
4. Identify semen with the use of a p30 card.

Comments:

Trainee	Date	Trainer or Reviewer	Date
Print Name + Initial		Print Name + Initial	

MODULE 10 - TRAINER'S EVALUATION FORM

Amylase Screening – Module 10

- | | | |
|---|--------------------------|---|
| 1. Relevance of examination in casework | <input type="checkbox"/> | |
| 2. Examination approach | <input type="checkbox"/> | |
| 3. Reagent preparation | <input type="checkbox"/> | † |
| 4. RSID™ cards | <input type="checkbox"/> | |
| 5. Phadebas® paper † | <input type="checkbox"/> | |
| 6. Documentation † | <input type="checkbox"/> | |
| 7. Competency: Minimum of five correctly characterized stains † | <input type="checkbox"/> | |

At the end of this module, the trainee should be able to:

1. Test stains using proper procedures for Rapid Stain Identification (RSID)™ cards, and Phadebas® paper.
2. Interpret test results and draw appropriate conclusions.

Comments:

Trainee	Date	Trainer or Reviewer	Date
Print Name + Initial		Print Name + Initial	

MODULE 11 - TRAINER'S EVALUATION FORM

Urine and Feces Identification – Module 11

Presumptive urine testing

- | | | |
|---|--|--------------------------|
| 1. Physical characteristics of urine † | | <input type="checkbox"/> |
| 2. Testing for presence of THP † | | <input type="checkbox"/> |
| 3. Testing for presence of urea by radial diffusion † | | <input type="checkbox"/> |
| 4. Documentation † | | <input type="checkbox"/> |

Presumptive fecal material testing

- | | | |
|---|--|--------------------------|
| 1. Physical characteristics of fecal material † | | <input type="checkbox"/> |
| 2. Testing for presence of urobilinogen † | | <input type="checkbox"/> |
| 3. Testing for presence of microscopic elements | | <input type="checkbox"/> |
| 4. Documentation † | | <input type="checkbox"/> |

At the end of this module, the trainee should be able to:

1. Describe the physiological basis of testing for THP and urea as presumptive indicators for the presence of urine.
2. Describe the physiological basis of testing for urobilinogen and by microscopic examination as presumptive indicators for the presence of fecal material.
3. Test biological stains for the presence of THP and urea.
4. Test biological stains for the presence of urobilinogen and by microscopic examination.

Comments:

Trainee	Date	Trainer or Reviewer	Date
Print Name + Initial		Print Name + Initial	

MODULE 12 - TRAINER'S EVALUATION FORM

Hair Identification and Evaluation- Module 12

Identifying Hairs and Fibers

- | | |
|---|--------------------------|
| 1. Theory and relevance of examination in casework | <input type="checkbox"/> |
| 2. Illumination methods and using the stereomicroscope | <input type="checkbox"/> |
| 3. Examination of known fibers | <input type="checkbox"/> |
| 4. Examination of known human head, pubic and body hairs | <input type="checkbox"/> |
| 5. Examination of known animal hairs | <input type="checkbox"/> |
| 6. Practical examination of tape lifts from clothing and/or car seats, identifying hairs and fibers | <input type="checkbox"/> |
| 7. Competency test with a minimum of 10 correctly characterized and identified hairs or fibers. | <input type="checkbox"/> |

At the end of this module the trainee should be able to:

1. Identify a human hair from a fiber.
2. Identify a human hair from animal hair.
3. Evaluate whether a human hair has a root which can be used for DNA analysis

Comments:

Trainee	Date	Trainer or Reviewer	Date
Print Name + Initial		Print Name + Initial	

MODULE 1 - REFERENCE READING SIGN OFF RECORD

TRAINEE _____

Reference	Trainee Initials	Date Completed
1.3.1 WSP Quality Manual		
1.3.2 WSP CLD Operations Manual		
1.3.3 DNA Quality Assurance Manual		

MODULE 2 - REFERENCE READING SIGN OFF RECORD

TRAINEE _____

Reference	Trainee Initials	Date Completed
2.3.1 CLD Safety Manual		
2.3.2 Emergency Preparedness Plan (lab-specific)		

MODULE 3 – REFERENCE READING SIGN OFF RECORD

TRAINEE _____

Reference	Trainee Initials	Date Completed
3.3.1 WSP Forensic Services Guide		
3.3.2 Selected portions of the LIMS Manual		

MODULE 4 – REFERENCE READING SIGN OFF RECORD

TRAINEE _____

Reference	Trainee Initials	Date Completed
4.3.1 WSP Biochemical Analysis Procedures		

MODULE 5 – REFERENCE READING SIGN OFF RECORD

TRAINEE _____

Reference	Trainee Initials	Date Completed
5.3.1 WSP Biochemical Analysis Procedures		
5.3.2 Alternate Light Source User's Manual (lab specific)		

MODULE 6 – REFERENCE READING SIGN OFF RECORD

TRAINEE _____

Reference	Trainee Initials	Date Completed
6.3.1 Abacus Hematrace® package insert.		
6.3.2 Blake and Dillon, "Microorganisms and the Presumptive Tests for Blood," J. of Political Science Administration, Vol. 1, #4, Dec. 1973.		
6.3.3 Cox, M., "Effect of Fabric Washing on the Presumptive Identification of Bloodstains", J. For Sci., Vol. 35, #6, November 1990, pp. 1335-1341.		
6.3.4 Cox, M. "A Study of the Sensitivity and Specificity of Four Presumptive Tests for Blood", J. For. Sci., Vol. 36, #5, September 1991, pp. 1503-1511.		
6.3.5 Culliford BJ. In: The Examination and Typing of Bloodstains in the Crime Laboratory. U.S. Department of Justice, Law Enforcement Assistance Administration; 1971; (Phenolphthalein).		
6.3.6 Gaensslen, R.E. 1983. Sourcebook in Forensic Serology, Immunology and Biochemistry. Washington, D.C. U.S. Department of Justice. 85-87, 101-116.		
6.3.7 Lee HC. Identification and Grouping of Bloodstain. In: Saferstein (ed.), Forensic Science Handbook. Englewood Cliffs: Prentice Hall; 1982; 272-279.		
6.3.8 Lehninger AL. Biochemistry. 2nd Ed. New York: Worth Publishers; 1975.		
6.3.9 Higaki RS & Philp WM. A Study of the Sensitivity, Stability and Specificity of Phenolphthalein as an Indicator for blood. Can. Soc. For. Sci J. 1971;9(3):97-102.		
6.3.10 Hochmeister MN. Validation studies of an immunochromatographic 1-step test for the forensic identification of human Blood. Journal of Forensic Sciences 1999;44(6):597-602.		
6.3.11 Metropolitan Police Forensic Science Laboratory. Biology Methods Manual. London: Commissioner of Police of the Metropolis; 1978: pages 2-88 to 2-91.		
6.3.12 Rowley B. Commentary on Hochmeister, MN. "Validation studies of an immunochromatographic 1-step test for the forensic identification of		

human blood.” Journal of Forensic Sciences 1999;44(6):1323-4.		
6.3.13 Serology Unit Protocol Manual. Washington D.C.: U.S. Department of Justice, FBI Laboratory 1989:2-3 to 2-4, 2-10 to 2-11.		
6.3.14 Spalding RP, Cronin WF. Technical and Legal Aspects of Forensic Serology: A Laboratory Manual. Washington D.C.: U.S. Department of Justice, FBI, 1984.		
6.3.15 WSP Biochemical Analysis Procedures		

MODULE 7 – REFERENCE READING SIGN OFF RECORD

TRAINEE _____

Reference	Trainee Initials	Date Completed
7.3.1 Bevel and Gardner, Bloodstain Pattern Analysis, Chapter 1-3, 5, 10, 11, 13.		

MODULE 8 – REFERENCE READING SIGN OFF RECORD

TRAINEE _____

Reference	Trainee Initials	Date Completed
8.3.1 Brown, Barry L. and Baechtel, F. Samuel, "Application of Immunologic Methods to Forensic Science", Crime Laboratory Digest, Vol. 11, #1, January 1984.		
8.3.2 Culliford BJ. In: The Examination and Typing of Bloodstains in the Crime Laboratory. U.S. Department of Justice, Law Enforcement Assistance Administration; 1971; (Species).		
8.3.3 Lee HC. Identification and Grouping of Bloodstain. In: Forensic Science Handbook. Saferstein (ed.). Englewood Cliffs: Prentice Hall; 1982; 283-287.		
8.3.4 Metropolitan Police Forensic Science Laboratory. Biology Methods Manual. London: Commissioner of Police of the Metropolis; 1978: pages 2-93 to 2-94.		
8.3.5 Sensabaugh, G.F., "Molecular Evolution and the Immunological Determination of Species", Int. Microform J. of Legal Medicine, Vol. 11, #2, 1976.		
8.3.6 Gaensslen, R.E. 1983. Sourcebook in Forensic Serology, Immunology and Biochemistry. Washington, D.C. U.S. Department of Justice. 221-241.		
8.3.7 WSP Biochemical Analysis Procedures		

MODULE 9 – REFERENCE READING SIGN OFF RECORD

TRAINEE _____

Reference	Trainee Initials	Date Completed
9.4.1 Abacus OneStep p30 card product insert.		
9.4.2 Allard JE. The collection of data from finding in cases of sexual assault and the significance of spermatozoa on vaginal, anal, and oral swabs. Science and Justice 1997;37(2):99-108.		
9.4.3 Baechtel F. The Identification and Individualization of Semen Stains. In: Saferstein (ed.), Forensic Science Handbook, vol. 2. Englewood Cliffs: Prentice Hall; 1988: 347-68.		
9.4.4 Blake and Sensabaugh, "Genetic Markers in Human Semen: A Review", J. of Science, Vol. 21, #4 Oct. 1976, pp. 784-796.		
9.4.5 Brauner and Gallili, "A Condom-the Critical Link in a Rape", J. For. Sci., Vol. 38, #5, September 1993, pp. 1233-1236.		
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13.0 REVISIONS

Biochemistry Training Manual

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Rewritten manual and converted to CLD ISO format.