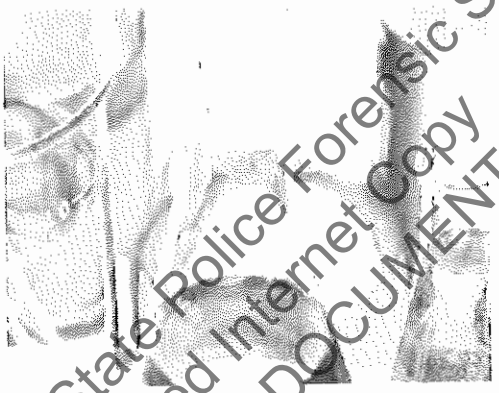
Idaho State Police
Forensic Services

Approval for Quality System Controlled Documents



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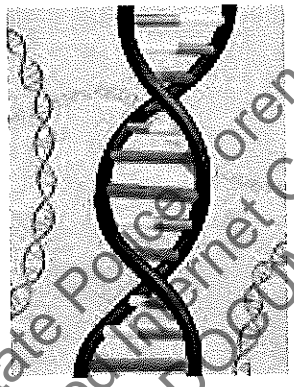
Forensic Biology Training Manual

Revision #1



APPROVED
September 6, 2011

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REVISION RECORD

The following table must be filled out when revisions to the Forensic Biology Training Manual are made.

Date:	The effective date of the revision(s).
Revision #:	The manual revision number.
Description:	A brief description of the changes made to the manual.
Addition:	This column is checked if the revision reflects an addition (e.g. new SOP or form) to the manual.
Deletion:	This column is checked if the revision reflects a deletion (e.g. SOP or form no longer in use) from the manual.
Initials:	Initials of the Technical Leader making the revisions.

Date	Revision #	Description	Addition	Deletion	Initials
9/6/11	1	Rewrite of all sections, reformatting, expanded exercises and evaluation form, added review and CODIS modules, added database/casework specific background and exercises	X		CRC

Table of Contents

INTRODUCTION

The purpose of this manual is to provide an in-house training program designed to prepare the trainee with the theoretical and practical background necessary to perform reliable analysis. The program is composed of a series of modules consisting of reading materials, observation and demonstration, practical exercises, and demonstration of competency. A competency test may consist of a written, oral, or hands-on practical test, or any combination of these. Whenever possible or practical, the training modules may be supplemented with technical lectures provided by qualified analysts. Progress of the trainee will be monitored through the use of a training evaluation form (refer to **Form 100-TR**), in which successful completion of a module is indicated by the signatures of the trainee, trainer, and/or technical leader. External training, where available, may also be used to supplement and/or meet certain portions of the training program, as appropriate.

The training program, in its entirety, is designed for the trainee who has no prior background or experience in the subject matter. The modules outlined are the minimum requirements for completion of training; however, additional exercises may be assigned, at the discretion of the technical leader, if necessary. Alternatively, the training may be abbreviated for analysts with experience and training from another organization or those individuals who perform only limited duties. The background and experience of the individual will be assessed prior to beginning the training program. This assessment will be made by the individual's technical leader. In some instances, it may be sufficient for the experienced analyst to simply complete a competency test prior to beginning analysis.

The training modules do not need to be completed in sequence. Depending on the needs of the laboratory and the trainee's experience level, certain modules may be prioritized and at their completion the trainee may be allowed to perform limited work in that area.

Roles and Responsibilities

Technical Leader	The unit technical leader is responsible for monitoring the training process and for the final approval of the trainee's release to process casework or offender samples. The technical leader should regularly monitor the trainee's progress and review their training binder for completeness and accuracy. At a minimum, the technical leader should meet with the trainee at the end of each module to discuss the exercises and any further actions.

Trainer

The trainer will be the unit technical leader or their designee. He/she is responsible for demonstrating a particular technique and observing the trainee perform the same procedure where applicable. This process should include the following elements: demonstration/instruction by the trainer; technique performed by the trainee/instruction given by the trainer; technique performed by the trainer/instruction given by the trainee; demonstration/instruction by the trainee. Information gained from reading materials should be reinforced through detailed discussion of the technique during the demonstration and/or observation. This information should include both theoretical and practical aspects.

The trainer is also responsible for verifying that the trainee is meeting each of the milestones leading to the successful completion of the module and/or training program. The trainer's initials on the training evaluation form and training logs indicate that the trainee has successfully completed the observation or exercise on the date indicated. Exercises and competency tests will be evaluated by the trainer and/or the unit technical leader prior to initialing and dating the checklist. In addition, Supervised Casework and Technical Review logs will be completed by the trainer. The trainer, if not the technical leader, shall periodically meet with the technical leader to discuss the progress of the trainee.

Trainee

The trainee is responsible for maintaining a training binder or notebook which will contain the records (i.e. notes, worksheets, photographs, etc.) generated during the training program. The trainee's initials on the training evaluation form indicate that the trainee has successfully completed the reading/review of the selected material on the date indicated. The trainee should keep the trainer and unit technical leader informed as to their progress and/or any problems or questions that may arise. The trainee has the ultimate responsibility for learning the materials necessary to successfully complete competency tests and should take an active role in obtaining the information needed (reading, observation, discussing/asking questions, etc.) to do so. The trainee is also responsible for recording each required observation on the appropriate log. At any time a trainee feels that their training is not progressing or that they are experiencing difficulty with the exercises they should meet with their unit technical leader to discuss their situation.

1.0 Module 1: Laboratory Introduction

1.1 Background Information and Theory

Within the Idaho State Police (ISP) there are three Forensic Services laboratories, located in Meridian, Pocatello, and Coeur d'Alene. The function of the laboratories is to provide fair and impartial scientific analysis to the criminal justice system. Although not all services are available at every laboratory, examinations, assistance, and testimony are offered in the following areas: controlled substances, shoe prints, tire tracks, latent prints, forensic biology (screening and DNA), DNA database, crime scenes, clandestine laboratories, toxicology, blood/breath alcohol, firearms, and toolmark analysis. In addition, ISP Forensic Services provides training to law enforcement agencies, attorneys, and medical personnel.

Since 1987, all three laboratories have been accredited by the American Society of Crime Laboratory Directors - Laboratory Accreditation Board (ASCLD-LAB). Laboratory accreditation is granted to those that meet required quality assurance (QA) standards and it helps to provide confidence in the quality of work generated by a lab. QA covers the overall laboratory system and includes measures taken by the lab to monitor, verify, and document performance to demonstrate that a product or service meets specified requirements for quality. Quality control (QC) includes activities done to ensure that a product or service meets specified quality standards. QC is a functional check on QA. In addition to equipment and methods, quality standards also apply to lab staff. Those working in the lab must take a scientific and objective approach to their work, which means being unbiased, using control and reference samples, and keeping accurate records. Both organizations and individuals continue to be challenged to reach higher quality standards.

Universal precautions and safe laboratory technique should be practiced when working with items that potentially contain biological material. Biological materials may contain several infectious agents, which vary in their survival time outside the body. In general, the analyst should treat all items of evidence and offender samples as if they were positive for one or more of these pathogens and take the appropriate precautions (e.g. gloves, laboratory coat, face

protection, etc.) when examining them. Proper decontamination procedures and disposal of contaminated waste should be maintained in order to aid in the individual's protection and the removal of the pathogen.

1.2 Objectives

To gain familiarity with Idaho State Police as an organization, the Forensic Services laboratory, the Biology Section, and the policies and procedures which guide the laboratory operations.

1.3 Practical Exercises

Reading and observation, as outlined in the corresponding evaluation form.

1.4 Principles and Knowledge

The analyst should have an understanding of ISP and the Forensic Services laboratory, which may include but is not limited to the following:

- Orientation to Laboratory/ISP Facilities
- Organizational Structure, Chain of Command, and Policies and Procedures
- Security and Confidentiality Issues (e.g., access codes, visitors, communications, and data privacy)
- Quality Assurance/Quality Control
- Health and Safety Guidelines (e.g., universal precautions, bloodborne pathogens, biohazard disposal, decontamination, and vaccinations) *Note: Safety hazards associated with specific analytical methods and/or instruments will be covered as part of the associated module.*
- Location and Use of Safety Equipment
- Introduction to Other Forensic Disciplines
- Ethics in Forensic Science

2.0 Module 2: Evidence/Offender Sample Handling

2.1 Background Information and Theory

2.1.1 Evidence Items

Maintaining evidence integrity is imperative for every forensic science discipline. Several steps should be taken to accomplish this goal. The chain of custody must be maintained from the time of collection until presentation in the courtroom, meaning everyone who handles the evidence must sign for it and record what they did with it. Secure packaging is essential to restrict access to the item and it must not be left unattended to prevent tampering or theft. Evidence must be properly stored, which may involve refrigeration and protection from moisture, to prevent deterioration. Documented procedures must also be followed to minimize loss, contamination and/or deleterious change. It is also necessary to understand other evidentiary requests and needs. All of the examinations, analyses conducted, and samples collected must be properly documented.

All evidence submitted to the laboratory is entered into an evidence tracking or laboratory information system. The system is a computer program used to assign unique laboratory case and item numbers for all submitted evidence. Each item has a corresponding barcode placed on the outer packaging as an identifier, which allows tracking of its movement while in the lab. The system also allows for the maintenance of case information, including items submitted, analyses requested, reports, and status.

2.1.2 Offender Samples

In 1996 Idaho passed a law (§19-5501 - §19-5518) which authorized the creation of a database for the retention of DNA profiles of offenders convicted of specific crimes. ISP Forensic Services began collecting those samples in 2000.

The offender samples are collected, normally by corrections officers or law enforcement personnel, as a buccal swab transferred to FTA paper. The sample is stable

for several years at room temperature because the paper contains chemical substances which protect DNA from degradation by enzymes and bacterial growth.

Offender samples received into the laboratory for entry into the DNA database are not treated as evidence. The received date is documented on each sample and the corresponding information is entered into the computer system (Tracker). Tracker is used to manage offender samples and court orders, including but not limited to the following: identification of duplicates, generation of unique identification numbers, storage of offender details (identifying information and offense), thumbprint/state ID verification for flagging of criminal histories, and tracking the progress of sample processing/testing. To prevent tampering or theft the samples must not be left unattended or unsecured.

2.2 Objectives

To introduce the trainee to the proper procedures for evidence or offender sample acceptance, receipt, documentation, and handling, as well as, to become familiar with the computer system used for either Casework or Database sample tracking.

2.3 Practical Exercises

Reading and observation, as outlined in the corresponding evaluation form.

2.4 Principles and Knowledge

The analyst should have an understanding of evidence or offender sample handling, which may include but is not limited to the following:

- Case/Evidence/Offender Sample Acceptance and Receipt
- Computer System (e.g., Evidence Tracking/LIMS, Tracker)
- Chain of Custody Maintenance/Documentation
- Evidence/Offender Sample Packaging and Storage
- Evidence Handling, Retention/Consumption, and Documentation
- Case Assignment (backlog and tracking procedures)

3.0 Module 3: Supplies, Quality Control, and Reagents

3.1 Background Information and Theory

An important part of QA is routine quality control checks such as temperature monitoring, decontamination, and safety equipment checks. It is imperative that the analyst be able to recognize problems, troubleshoot if necessary, and notify the appropriate personnel. Documentation is kept to track the QC checks, decontamination, and any problems observed.

Chemicals and reagents in the laboratory must be properly labeled and include a National Fire Protection Association (NFPA) chemical hazard label. This is a color coded, numerical system to indicate the health, flammability, and reactivity hazard of chemicals; symbols for special precautions may also be included. These requirements also apply to reagents prepared in the laboratory. In addition, documentation of all reagents made in-house and chemicals or reagents received into the lab must be recorded in the appropriate logs.

When working with chemicals, protective equipment should be worn and safe handling methods followed. The material safety data sheet (MSDS) can be a helpful resource for chemical handling and should be available for each substance used in the laboratory. A MSDS contains data regarding the properties of a particular substance. It is intended to provide workers and emergency personnel with procedures for handling or working with that substance in a safe manner. The form includes information such as physical data, toxicity, health effects, reactivity, storage, disposal, protective equipment and procedures for handling spills.

3.2 Objectives

To gain familiarity with ordering of supplies, reagents, and quality control in the Biology Section. After completion of this module the employee should be able to make reagents, order supplies/chemicals, and perform/document routine quality control checks.

3.3 Practical Exercises

Reading, observation of individual procedures (documented on the observation log), and the hands-on exercises listed below. All reading and observations must be completed prior to performing the corresponding exercises.

- Perform weekly quality control checks.
- Perform non-instrumental monthly quality control checks.
- Perform non-instrumental quarterly quality control checks.

3.4 Principles and Knowledge

The analyst should have an understanding of the laboratory procedures concerning general quality control and reagents/supplies used in the laboratory, which may include but is not limited to the following:

- Reagent Preparation and Log
- Purchasing Card Training
- Ordering and Documentation
- Chemical Inventory
- MSDS and Safe Handling/Use of Chemicals/Reagents
- Labeling and Documentation for Supplies and Chemicals/Reagents Made or Received in the Biology Section
- Quality Control Checks

4.0 Module 4: Biological Screening

4.1 Background Information and Theory

4.1.1 Blood Tests

A suspected bloodstain is first processed using a presumptive test. The test depends upon the catalytic peroxidase-like activity of the heme group of hemoglobin, which catalyzes the oxidation by peroxide of an organic compound (phenolphthalein or o-tolidine) to yield a colored product. These tests are not specific to blood, therefore, a positive color test alone should be interpreted as an indication of blood rather than a positive identification. However, a negative result is indicative of the absence of detectable quantities of blood. Color development before the addition of hydrogen peroxide may be due to the presence of a chemical oxidant. Several other substances may give a positive color reaction for these presumptive tests; however, they can generally be visually distinguished from blood.

The presumptive test is not specific for human blood so once a positive result is obtained, further steps must be taken if confirmation of human origin is necessary. One test is based on the immunological detection of human hemoglobin and the reaction time is dependent on the concentration. Any human hemoglobin present will combine with a dye-labeled antibody to form an antigen-antibody complex. This complex migrates to the test region where it is immobilized and a visible line forms. For positive results, it should be stated that human blood is indicated, rather than detected or identified, as some non-human species, such as higher order primates and members of the mustilidae family, may produce a positive result.

4.1.2 Semen Tests

The acid phosphatase test is used as a presumptive screening test for semen. Naphthyl phosphate is acted upon by the acid phosphatase enzyme to produce naphthol, which then combines with diazo blue B dye to give a violet-colored complex. Seminal acid phosphatase, which originates in the prostate gland of males, occurs at

concentrations 20 to 400 times higher than that of other body fluids and is present at higher concentrations in humans compared to other animal species. Since acid phosphatase occurs in other human tissues, animals, and plants, a positive test does not confirm the presence of semen. On the other hand, since this assay is dependent upon the amount of enzyme present, a negative acid phosphatase test does not necessarily mean that a stain does not contain semen.

The microscopic identification of spermatozoa is a conclusive test to identify the presence of semen. Human spermatozoa have a distinct size and morphology, but sperm cells of some species, other cells, and extraneous objects may appear similar. The "Christmas Tree" staining method is used to increase the contrast of the sperm to aid in identification. The method uses two 'dyes' containing nuclear fast red and picro indigo carmine, which results in nuclear material staining red and other cellular components green. Additionally, sperm exhibit a differential staining pattern in which the acrosomal cap stains a darker red than the remainder of the head.

The presence of semen in sperm negative samples is confirmed with the detection of the human semen-specific protein p30. P30 is a glycoprotein produced in the prostate gland and found only in males. The test is based on the immunological detection of p30 and operates in a manner like the confirmatory test for blood. P30 may also be detected in peripheral blood of males with prostate cancer and can be found in urine, probably due to leakage from prostate into urethra. P30 is present in semen of several Old World monkeys, but has not been detected in semen from other mammals.

4.1.3 Saliva Test

Saliva is difficult to conclusively identify because of the lack of sufficient amounts of detectable substances specifically unique to saliva. While it is not unique to saliva, the enzyme α-amylase provides an important parameter for saliva stain identification. Other body fluids that may contain α-amylase, include the following: pancreatic juice, fecal material, urine, blood, and semen. Methods for testing α-amylase depend on the enzyme's

ability to hydrolyze starch. Tests to distinguish between salivary and pancreatic amylase exist but are not commonly used in the field today.

4.1.4 Urine Tests

Like saliva, urine is difficult to conclusively identify because of the lack of sufficient amounts of substances unique to urine. Urea and Creatinine are two substances found in high concentrations in urine. These substances can also be found, at lower concentrations, in other fluids including: blood, perspiration, saliva and semen.

Urea is detected using the enzyme urease. Urease causes the urea to be broken down into ammonia and carbon dioxide. The ammonia is then detected using an indicator chemical. It can also be detected using litmus paper as the reaction will cause an increase in pH.

Creatinine is a byproduct of normal metabolism. It can be detected by applying a saturated solution of picric acid. The result is creatinine picrate which will change the color of the solution from yellow to orange.

DNA analysis is typically not performed on urine stains. Urine is composed primarily of water and salts and has a very low cellular concentration. Additionally, the bacterial content in urine can cause DNA degradation of the limited amount of cellular material present.

4.1.5 Feces Test

Fecal matter testing involves the identification of urobilogenin, a byproduct of bilirubin metabolism. Bilirubin is a byproduct of the breakdown of heme, a component of red blood cells. While not unique to fecal matter, it is found in high concentrations in the feces of carnivores and omnivores but will not be found in that of herbivores. Urobilogenin is oxidized to water soluble urobilin, when combined with alcoholic zinc acetate. This compound will fluoresce a bright green color when exposed to UV light.

DNA analysis is typically not performed on fecal matter or stains. Bacteria comprise approximately one third of fecal matter causing rapid DNA degradation. In addition,

many inhibitors of PCR are present in feces including: bile pigments and salts, polysaccharides and bilirubin. If these inhibitors are not removed, traditional extraction methods typically fail to yield a DNA profile from the sample.

4.1.6 Alternate Light Source

Dried stains of physiological fluids such as semen, saliva and urine can be difficult to locate on an item of evidence under normal room lighting conditions. Light travels through an energy spectrum from ultraviolet to gamma radiation. The visible light spectrum is between 400 and 600 nanometers(nm). Under standard lighting conditions (normal room lighting) dry semen stains are visible at approximately 350 to 400nm, which is below the range of visibility for the unaided eye. If the stain is exposed to light of a longer wavelength/lower energy (ultraviolet (UV) light),in a darkened room, particle excitation occurs causing fluorescence. Under these conditions semen stains have a strong visible fluorescence at approximately 450 nm. In order to visualize this fluorescence a filter must be used to block all light except for that within the range of 450nm. This is done by using orange colored goggles. Other substances may also fluoresce at these wavelengths of light which is why follow-up with a presumptive chemical test is necessary.

4.1.7 Infra-Red (IR)

Bloodstains on dark colored fabrics such as black fabrics and denims can be difficult to visualize. IR lighting/photography can be used to aid the analyst in locating these stains. Dark fabrics and bloodstains will absorb most of the light in the visible spectrum, making it difficult to distinguish the stain from the background. Infrared lighting (700 to 900nm)causes dark fabrics to reflect visible and infrared wavelengths of light. If present, a bloodstain on the fabric will typically still absorb both wavelengths of light. This will result in the background/fabric appearing white or grey while the bloodstain will still appear dark in color.

4.1.8 Evidence Examination/Sample Selection

Once the methods for locating and identifying potential biological evidence have been learned, it is important to be able to put them to use in examining evidentiary materials. During evidence examination, one should be aware of the potential importance of other types of analyses and every effort should be made to document, conserve, and/or collect these samples (e.g., bloodstain patterns, trace evidence, latent fingerprints, and DNA) so they are not lost. The presence of other types of evidence is useful in directing the examinations conducted and the order in which to do them. It is important to evaluate the significance of biological stains in relation to the evidence item and the entire case, especially in determining stains/samples to be selected for analysis. In order to accomplish this, a police report should be obtained to assist in directing/focusing the evaluation and analysis. When sample selection occurs, the report shall clearly indicate what was tested and make no inference about the entire population.

The following measures must be taken to avoid contamination of evidence during the examination process: examine victim and suspect evidence and/or evidence and reference samples separately, examine one item of evidence at a time, use clean examination paper for each item, properly clean implements and workbench, and change gloves as necessary. This is especially important with the increased sensitivity of Polymerase Chain Reaction (PCR) DNA typing methods.

4.2 Objectives

Gain the knowledge base and mastery of the technical skills necessary to examine/process items of evidence for the presence of biological substances. This includes, but is not limited to the following: safe handling of biohazards; observation, documentation, sample selection, and collection of stains (and trace material where appropriate); body fluid identification; and communication of findings through written reports. Upon successful completion of this module, an analyst will be able to perform casework processing up to and including the assembly of a "DNA Packet", write evidence screening reports, conduct QC checks of critical screening

reagents, and participate in research and/or validation relevant to the development and improvement of screening techniques employed in the Biology Section.

4.3 Practical Exercises

Reading, observation of individual procedures (documented on the observation log), and the hands-on exercises listed below. All reading and observations must be completed prior to performing the corresponding exercises.

Note: Samples that are collected and/or prepared for use in the hands-on exercises may be retained for use in future testing exercises. Some samples may include those previously collected and stored frozen.

4.3.1 Blood/Semen Sensitivity

- Prepare serial dilutions of liquid blood and semen to at least ≈1/10,000. Place 50 µl of each dilution onto clean white cloth and allow to air dry.
- Test the blood dilutions with the available presumptive reagents using the filter paper scratch method. At the point a negative result is obtained, begin taking minimally sized cuttings and test them directly until a negative result is achieved.
- Test a variety of 'aged' bloodstains with each presumptive reagent (use direct cuttings only as needed).
- Test the semen dilutions with freshly prepared acid phosphatase reagent using the moistened swab method. At the point a negative result is obtained, begin taking minimally sized cuttings and test them directly until a negative result is achieved. Additionally, choose a high concentration and a low concentration stain and perform AP mapping on them.
- Test a variety of 'aged' semen stains with the acid phosphatase reagent, as well as semen-stained vaginal swabs at varying post-coital intervals up to at least 48 hours and from at least two different couples (one set is to be

freshly collected and, if available, the other previously collected and stored frozen).

4.3.2 Blood/Semen Specificity:

- Prepare stains from a wide variety of body fluids, fruits, vegetables, and other substances. Test the stains using each of the presumptive blood and acid phosphatase reagents. It may be desirable to test some items (e.g fruits and vegetables) fresh as well (consult the literature and trainer for specific items to include).
- Test various non-human bloodstains (as available) using the presumptive blood reagents.

4.3.3 Alternate Light Source

- View all stains prepared thus far (blood and semen dilutions, body fluids, fruits, and vegetables) with the alternate light source (at each available wavelength) and note any observations (under both room and UV light).
- Place a small amount of semen on a variety of unstained fabrics/substrates (to include, but not limited to black fabric, denim, and floral-type patterns). View each with the alternate light source at each available wavelength for the observation of any inherent fluorescence, quenching, repetitive patterns and/or any effect from the substrate. If available, also view the previously stained black panties.

4.3.4 IR Cameras/Stereomicroscope

- Place a variety of bloodstains (to include fine spatter, drips, and transfer stains) onto a minimum of two different dark colored fabrics (one of which is black). Allow the stains to air-dry and view them under bright light using the stereomicroscope, taking notes on overall appearance of the stains. If available, also examine the previously stained black panties.
- Examine the above items with the available IR cameras. Note observations regarding color,

general stain appearance, and ease of visualization under IR vs. room lighting. Photograph a representative sample of the stains under both lighting conditions.

4.3.5 Microscopic Exam for Sperm

- View the photos of various animal sperm and describe (may include a sketch) the general appearance and stain patterns of each. Various yeast photos should also be reviewed as a general guideline only.
- Prepare an unstained slide and a 'Christmas Tree' stained slide of neat semen. Examine both slides under the microscope (using various powers of magnification) and note the general appearance of sperm and/or any other cells observed on each.
- Extract each of the previously prepared semen dilution stains and prepare a stained slide. View each of these slides under the microscope and note any observations. Include the approximate number of spermatozoa observed for each using both descriptive (i.e. few, moderate, many, etc.) and/or numeric (i.e. #/200X and 1+ - 4+) terms. Additionally, note any other cells observed. Document one slide representing each of the numeric ratings with a photograph. The Trainer will review a representative sample of these slides to confirm the rating of the number of sperm present.
- Prepare stained slides of semen-free vaginal swabs, buccal swabs, an unused lubricated condom swab, a neat aspermic semen stain, a bloodstain and the previously examined post-coital swabs. View these under the microscope and note the general appearance, numbers, and stain patterns of any cells observed.

Note: All of the remaining extracts from above should be retained for use in p30 exercises.

4.3.6 P30

Prepare or use previously prepared extracts for the following samples: semen dilution stains, post-coital

swabs, aged semen stains, and body fluids (must include a urine sample collected from a male). Test each of the extracts using the Abacus P30 test cards, according to the laboratory protocol.

4.3.7 Hematrace

Test the following items according to laboratory protocol, using the Abacus Hematrace test cards: previously prepared bloodstain dilution series, various aged bloodstains, body fluids, and animal bloodstains (as available).

4.3.8 Saliva

- Obtain a fresh saliva sample and prepare a dilution series to 1:1,000. Using the analytical method for Phadebas, test each of these dilutions to determine the sensitivity of the method. Additionally, saliva samples deposited on at least five different substrates (e.g. gum, eating utensils, etc.) and known saliva (neat, 1:100, and 1:500) from at least two different individuals are to be tested according to laboratory protocol.
- The specificity of the test method should also be determined by testing various body fluids and animal saliva, as available.

4.3.9 Urine

- Obtain a fresh urine sample and prepare a dilution series to 1:500. Using the analytical methods for Urease and Creatinine (as available), test each of these dilutions to determine the sensitivity of the method.
- The specificity of the test method should also be determined by testing various body fluids and animal urine, as available.

4.3.10 Feces

The following samples are to be tested using the analytical method for Urobilinogen: fresh human fecal stain, various body fluids, fecal stains from various

animals as available, and a stain prepared from Vegemite. Slides made from extracts of the human fecal and Vegemite stains are also to be prepared, stained, and viewed under the microscope for observation of general appearance and any cells present.

4.3.11 Case Review and Hands of the Analyst

- Review a minimum of ten case files (encompassing multiple sample types and analysts) to include note format, evidence description, sketches/photographs, sample selection, report writing, and communication logs.
- Process casework samples while under constant observation by the trainer or designated qualified analyst in custody of the items. The trainee will handle, examine and perform testing on each item. The case analyst will provide case documentation, with the trainee initialing test results. The report will be issued by the qualified analyst/trainer; however, the trainee will also prepare a summary of the testing results using the approved results statements listed in the biology/DNA quality manual.

4.3.12 Mock Cases

Process a minimum of two mock biological screening cases and write reports for each. The documentation and analysis of items are to be performed as would be done in the course of normal casework.

Note: non-probative cases may be processed in addition to mock cases as available.

4.3.13 Quality Control

Perform critical reagents kit QC.

4.4 Principles/Knowledge:

The analyst should have an understanding of biological evidence screening, which may include but is not limited to the following:

- Evidence Acceptance Policies and Testing Schemes
- Understand Screening Tests (e.g., theory, mechanism, sensitivity, limitations, various techniques, utility of controls, and safety hazards)
- Application of Biology Protocols for the Identification of Body Fluids
- Methods of Evidence Documentation
- Methods to Avoid Contamination
- Sample Selection Methods and Conclusions
- Case File Content and Organization
- Report Writing and Communication
- Qualtiy Control

5.0 Module 5: DNA Analysis

5.1 Background Information and Theory

DNA (Deoxyribonucleic Acid) is genetic material found in the nucleus of most cells in the body. DNA is comprised of nucleotide units that are made up of three parts: a nucleobase, a sugar, and a phosphate. Half of a person's DNA information comes from their mother and the other half from their father. The variation passed down in the form of alleles, is what makes DNA analysis such a powerful tool in the field of forensics (Butler, 2001).

A wide range of equipment is used in the process of conducting DNA analyses. It is important to ensure that the staff is trained to properly use the equipment and that it is regularly maintained and/or calibrated. Documentation is kept to track periodic function checks, maintenance, problems, and repairs or replacement of equipment.

5.1.1 History

DNA analysis has been used in the field of Forensics since 1985. Prior to DNA typing, conventional serological methods were utilized; however, they did not allow the analyst to make conclusive statements as to the identity of an individual. The first type of forensic DNA analysis used was restriction fragment length polymorphism (RFLP). RFLP is powerful in its ability to differentiate individuals; however, its application to forensic science is limited because of the large sample size required. PCR (polymerase chain reaction) was introduced into the field of forensic biology to address these limitations.

PCR has been successful in yielding genetic information from degraded samples and those of limited quantity. Early commercial kits (AmpliType HLA DQ-α, AmpliType PolyMarker and D1S80) were successful at typing degraded samples, but their discriminating power was lower than the RFLP method. This and other limitations lead to the development of the current method used in forensic DNA analysis, short tandem repeats (STRs). STRs are stretches of highly polymorphic, repetitive DNA sequences. The STR method has the benefits of the other PCR based systems but

without most of the limiting factors, such as lack of discrimination and clearly defined statistics. PCR based systems are highly sensitive, therefore special handling techniques must be used to prevent sample contamination.

5.1.2 Extraction

DNA must first be isolated from other cellular components and any non-biological material, as any residual material may inhibit subsequent analysis. The extraction procedure varies somewhat according to the type of biological evidence present, the amount of evidence, the kinds of cells present, and downstream processes.

Chelex extraction is a rapid method in which the samples are boiled in a solution containing beads of a chemical called Chelex. Boiling breaks open the cells to release the DNA and the Chelex binds extraneous materials, which might interfere in the analysis. The result is isolation of single-stranded DNA.

Organic extraction involves the serial addition of several chemicals to lyse cells and organic solvents to separate the high molecular weight, double-stranded DNA from cellular components. The DNA is further purified and concentrated using special filters.

Silica coated magnetic particles can be used to rapidly purify DNA. DNA in sample lysates binds to the silica surface of the particles in the presence of a chaotropic salt. The particles are then separated using a magnetic source, while other components are washed away. DNA can then be eluted in water or a low-salt buffer. This method can be used to clean-up inhibitors following other methods and is ideal for automated liquid handling with robotics.

Differential extraction relies on the different properties of epithelial cells and sperm cells in order to separate them from each other before DNA is isolated. This procedure involves preferentially breaking open the epithelial cells with chemicals and then isolating them from the sperm cell fraction. The sperm cells are then lysed with a different set of chemicals. Both fractions are then subjected to the organic or magnetic particle extraction.

FTA paper causes cells to lyse upon contact with the paper so a portion of the paper need only be washed with extraction buffer to remove inhibitors and purify the DNA.

5.1.3 Quantitation

Before the analysis proceeds, it is imperative to determine the quantity and quality of DNA. Because a narrow concentration range is optimal, determination of the amount and condition of DNA in a sample is essential for most PCR-based systems. Too much input DNA can result in peaks that are off-scale for the measurement technique. Too little template DNA may result in allele 'drop-out' because the PCR reaction fails to amplify the DNA properly.

Real-time PCR (RT-PCR) or quantitative RT-PCR is a technique used to amplify and simultaneously quantify one or more targeted sequences in a DNA molecule. Presence of those sequences is detected as the reaction progresses in real time, by measuring fluorescence after excitation with a laser; increased product causes increased fluorescence at each cycle. Amplified DNA theoretically doubles at every cycle during the exponential phase and relative amounts of DNA can be calculated by plotting fluorescence against the cycle number on a logarithmic scale and comparing the results to a standard curve produced by RT-PCR of serial dilutions of a known amount of DNA.

5.1.4 Amplification

PCR is an enzymatic process in which specific regions of DNA are replicated over and over again to yield many copies of particular sequences. This molecular 'xeroxing' process involves heating and cooling samples in a precise thermal cycling pattern for ~30 cycles. During each cycle, a copy of the target DNA sequence is generated for every molecule containing the target sequence. Theoretically, after 30 cycles approximately a billion copies of the target region on the DNA template will have been generated. In most forensic applications, fluorescently labeled primers are used to amplify and tag specific regions of DNA. The resulting PCR product is then of sufficient quantity, and in a detectable form for genetic analysis.

5.1.5 Detection

The PCR products, or fragments of DNA, must be separated and detected. Capillary electrophoresis (CE) is used to separate the fragments by size. The negatively charged phosphate groups of DNA cause migration away from the negative electrode and toward the positive electrode when an electric field is applied. A viscous polymer, contained within the capillary, acts as a sieving medium in which smaller molecules will pass more quickly. As the DNA fragments travel through the capillary they eventually reach a laser window where they are illuminated, which excites the fluorescent dyes attached to the fragments and light is emitted at a specific wavelength for each dye. The light is collected and separated according to wavelength. The data collection software collects the light intensities and stores them as electrical signals. Computer software is then used to analyze the collected data and present it for interpretation.

CE allows for automation of the sample injection, separation, and detection. The separations are fast, little sample is used, retesting is easy, and cross-contamination risk is reduced.

5.1.6 Documentation and Evidence Sample Selection

Once the appropriate components of DNA analysis have been successfully completed, it is important to be able to put them to use in conducting case analysis. Taking proper notes, correctly filling out worksheets, choosing the proper method of analysis, and carrying out each step while avoiding contamination are important during the analysis of case evidence and database samples.

The following measures must be taken to avoid contamination during analysis: properly clean implements, plates/tube racks, and workbench; use clean examination paper; separate question and known casework samples by time and/or space; use appropriate blanks and controls; and change gloves as necessary.

It is important to be organized, clear, and concise, while including important details during case documentation. It is also important to not loose sight of the overall

details of the case while conducting each step of the analysis. Proper avenues should be taken to obtain the information needed about the case to enable proper sample selection and analysis. One must be organized in the handling of information for each case and be able to properly organize the documentation in the form of a note packet and report. The report of analysis will reflect results for only the sample(s) selected for testing, without making an inference about the entire population.

5.2 Objectives

To gain the necessary knowledge base and mastery of the technical skills needed to perform all aspects of DNA analysis. This includes, but is not limited to, the following: historical understanding of DNA analysis and its application in forensic science, theoretical and applied skills in DNA methodologies, familiarity with instrumentation, contamination awareness and use of 'clean technique', mixture interpretation, and relevant population genetics and statistical analyses. Upon successful completion of this module an analyst will be able to operate the necessary instrumentation (including performance/documentation of maintenance), perform, interpret, and communicate the results of DNA analyses, conduct critical reagent QC, and participate in research/validation relevant to the future development and improvement of DNA methodologies employed in the Biology Section.

5.3 Practical Exercises

Reading, observation of individual procedures (documented on the observation log), and the hands-on exercises listed below. All reading and observations must be completed prior to performing the corresponding exercises.

5.3.1 Casework

Exercises need not be performed in the order listed below. Retain all collected and/or prepared samples and extracts (store frozen) for use throughout the hands-on exercises.

5.3.1.1 Extraction

- Obtain known liquid blood samples from five different individuals and prepare two 5ul bloodstains from each. Extract the entire stain on the Qiagen BioRobot EZ1(s) using a 50ul elution volume for one set and 200ul for the other.
- Prepare serial dilutions of two blood samples to 1:500 and make three 5ul stains for each dilution amount. Perform EZ1, organic and chelex extraction for each dilution.
- Perform EZ1 extraction on various body fluids (collected from a single individual as much as possible), included but not limited to blood, semen, aspermic semen, vaginal fluid, hair, saliva, urine, and feces. Compare liquid versus stains where applicable.
- Collect reference oral swabs from the mother, father, and child(ren) of at least three different families. Extract each on the EZ1(s).
- Prepare mixtures of the following body fluids collected from different individuals (male and female where appropriate), in ratios of 50:1, 25:1, 10:1, 1:1, 1:10, 1:25, and 1:50, by volume: blood:semen; saliva:semen; blood:blood; saliva:blood; semen:semen. Perform EZ1 extraction on each of the mixtures, using the differential extraction method on those samples containing semen (except semen:semen).
- Perform a differential extraction (organic and EZ1) on semen-stained vaginal swabs collected at varying post-coital intervals (to at least 48 hours).

5.3.1.2 Quantitation

- Using the current quantitation kit, prepare the standard dilution series. Perform a quantitation of these standards and print the standard curve. Compare the R^2 and slope to that of the kit QC/SRM 2372 results.
- Prepare a dilution series (similar to that of the quantitation kit standard) of the positive amplification control (9947A). Perform a quantitation of these dilutions and, without using

the automated 7500 results form, perform the normalization calculations.

- Retrieve 10 previously quantitated extraction control samples and note the concentration listed for each. Re-quant each of these 10 samples and compare results to those previously obtained. Manually calculate normalization dilutions for these samples. Import the results into the automated 7500 results form and re-calculate the normalization values using the form. Compare the results and note any differences.
- Prepare a written summary of all observations made. If differences are observed from known values (or previous results), discuss the significance and give possible reasons for the discrepancies, if known.

  Note: Samples extracted in 5.3.1.1 will also need to be quantitated (see below); however, they are independent of successful completion of this section.

- Perform quantitation and normalization calculations on each of the samples extracted in 5.3.1.1. Compare the concentration obtained from body fluids of the same individual, as well as duplicate samples extracted with different methods or different elution volumes.

5.3.1.3 Amplification

- Prepare a dilution series from 2ng - 0.03ng of 9947A or previously extracted and quantified DNA. Amplify each sample using the approved protocol.
- Prepare a dilution series of high concentration samples (may be previously extracted/quantified or newly extracted/quantified) from 10ng - 2.5ng. Amplify each using the approved protocol.
- Amplify each of the extracted/quantified samples listed in 5.3.1.1.

5.3.1.4 Capillary Electrophoresis and Data Analysis

- Using provided electropherograms (single source and mixtures) and sizing tables, manually genotype each

sample, taking into account stutter and any other artifacts that may be present. Analyze the corresponding .FSA files in Genemapper ID. Compare the allele calls made.

- Perform Genetic Analyzer instrument setup (trap flush, water wash, buffer change, water change, polymer change or replenish, and array change if necessary). Prepare and run a matrix/spectral calibration, as well as a spatial.
- Run the sensitivity dilution series amplified in 5.3.1.3 at 3 seconds, 5 seconds, and 10 seconds. Analyze the data and observe any stochastic effects/allele drop out and the lower limits of detection.
- Run the high concentrations samples amplified in 5.3.1.3. Analyze the data and note any -A, stutter, pull-up or other artifacts that may be present. Dilute amplified product and rerun as warranted.
- Run the single source bloodstains (50ul/200ul elution and dilution series) and analyze the data. Note any stochastic effects/allele dropout and calculate peak height ratios for heterozygous loci.
- Run the body fluid mixture samples, varying injection time as necessary. Analyze the data and note the levels at which a minor component can be detected. Perform mixture calculations, as appropriate, to aid in determining the most likely major and minor genotypes.
- Run the remainder of the samples amplified in 5.3.1.3, varying injection times as necessary. Analyze the data and perform mixture deconvolution as appropriate.

5.3.1.5 Statistics

- Perform statistical calculations for paternity on each of the family samples.
- Perform random match probability or mixture calculations (likelihood ratio or probability of inclusion/exclusion), as appropriate, for one set of body fluid mixtures and the post-coital samples.

5.3.1.6 Case Review

Review a minimum of ten case files (encompassing multiple sample types and analysts) to include note format/worksheets, evidence description, sketches/photographs, sample selection, statistics, report writing, and communication logs.

5.3.1.7 Mock Cases

Process a minimum of two mock DNA cases and write reports for each. The documentation and analysis of items are to be performed as would be done in the course of normal casework. A previously analyzed (or known results) proficiency test may be substituted for one of the mock cases.

Note: non-probative cases may be analyzed in addition to mock cases as available.

5.3.2 Database

5.3.2.1 Extraction

- Obtain buccal FTA samples from a minimum of 16 different individuals. Punch the samples using the BSD puncher and perform FTA extraction, manual DNA IQ extraction, and Automated Biomek DNA IQ extraction on each.
- Obtain 40 buccal FTA samples (may use duplicate samples if necessary). Punch the samples into a 'checkerboard' (i.e. samples alternating with blanks) plate pattern with the BSD puncher. Extract the plate using the Automated Biomek DNA IQ method.
- Obtain minimum of 23 buccal FTA samples (include 1 reagent blank). Punch each sample onto two separate plates with the BSD puncher. Perform Automated Biomek DNA IQ extraction with an elution volume of 100ul for one set and 50ul for the other.

5.3.2.2 Quantitaion

- Using the current quantitation kit, prepare the standard dilution series. Perform a quantitation of these standards and print the standard curve. Compare the R^2 and slope to that of the kit QC/SRM 2372 results.
- Prepare a dilution series (similar to that of the quantitation kit standard) of the positive amplification control (9947A). Perform a quantitation of these dilutions and, without using the automated 7500 results form, perform the normalization calculations.
- Retrieve 10 previously quantitated extraction control samples and note the concentration listed for each. Re-quant each of these 10 samples and compare results to those previously obtained. Manually calculate normalization dilutions for these samples. Import the results into the automated 7500 results form and re-calculate the normalization values using the form. Compare the results and note any differences.
- Prepare a written summary of all observations made. If differences are observed from known values (or previous results), discuss the significance and give possible reasons for the discrepancies, if known.

  Note: Samples extracted in 5.3.2.1 will also need to be quantitated (see below); however, they are independent of successful completion of this section.

- Perform quantitation and normalization calculations on each of the samples extracted in 5.3.2.1 (FTA extracted samples will not be quantified). Compare the concentration obtained from duplicate samples extracted with different methods or different elution volumes.

5.3.2.3 Amplification

- Prepare a dilution series from 2ng - 0.03ng of 9947A or previously extracted and quantified DNA. Amplify each sample using the approved protocol.

- Prepare a dilution series of high concentration samples (may be previously extracted/quantified or newly extracted/quantified) from 10ng - 2.5ng. Amplify each using the approved protocol.
- Amplify each of the extracted/quantified samples listed in 5.3.2.1.

5.3.2.4 Capillary Electrophoresis and Data Analysis

- Using provided electropherograms and sizing tables, manually genotype each sample, taking into account stutter and any other artifacts that may be present. Analyze the corresponding .FSA files in Genemapper ID. Compare the allele calls made.
- Perform Genetic Analyzer instrument setup (trap flush, water wash, buffer change, water change, polymer change or replenish, and array change if necessary). Prepare and run a matrix/spectral calibration, as well as a spatial.
- Run the sensitivity dilution series amplified in 5.3.2.3 at 3 seconds, 5 seconds, and 10 seconds. Analyze the data and observe any stochastic effects/allele drop out and the lower limits of detection.
- Run the high concentrations samples amplified in 5.3.2.3. Analyze the data and note any -A, stutter, pull-up or other artifacts that may be present. Dilute amplified product and rerun as warranted.
- Run the samples amplified in 5.3.2.3, varying injection times as necessary and analyze the data.

5.3.2.5 Previously Typed Offender Samples

Process two full plates of previously-typed offender samples. Include an extraction control and reagent blank on each plate. The documentation and analysis of samples are to be performed as would be done in the course of normal database analysis. Previously analyzed (or known results) proficiency test samples may be substituted for some of the offender samples.

5.3.3 Quality Control

- Perform critical reagents kit QC.
- Perform monthly maintenance/QC on instruments.
- Perform quarterly maintenance/QC on instruments.

5.4 Principles/Knowledge:

The analyst should have an understanding of DNA analysis, which may include but is not limited to the following:

- Fulfillment of Coursework Requirements (dictated in current national guidelines)
- Basic Forensic DNA Knowledge (e.g., terms, biochemistry, technological history, statistics/population genetics, and mixture interpretation)
- Understanding of DNA Methodologies (e.g., theory, mechanism, sensitivity, limitations, utility of controls, and safety hazards)
- Application of Biology Section Protocols for DNA analysis
- Assessing Biological Samples for DNA Analysis (Sample Selection Methods for Casework)
- Methods to Avoid Contamination
- Case File or Database Packet Content and Organization
- Report Writing and Communication
- Operation/Maintenance/Documentation of Instrumentation in the Biology Section

6.0 Module 6: Court: Decisions and Testimony

6.1 Background Information and Theory

Often times following the completion of an evidentiary examination and issuance of a report, the analyst is called to present those results to a jury. It is important not only for the analyst to understand the techniques employed and the interpretation of results, but to be able to explain them to a group of people who may not have a science background. This explanation is achieved through a series of questions and answers between the attorneys and the analyst. It is therefore important to become familiar with court proceedings and testimony etiquette in order to answer these questions factually, accurately, and concisely. The analyst must remember that he/she is presenting facts regarding the evidence and analytical results and should remain an unbiased witness throughout the proceedings.

6.2 Objectives

To introduce the trainee to the legal system in the state of Idaho, relevant case law regarding scientific testimony, and to acquire the knowledge base and skills necessary to become a competent expert witness.

6.3 Practical Exercises

Reading, observation, and mock courts, as outlined in the corresponding evaluation form.

6.4 Principles/Knowledge:

The analyst should have an understanding of courtroom testimony and procedures, which may include but is not limited to the following:

- Relevant Literature and Court Decisions
- Courtroom Procedures and Rules
- Proper Attire and Demeanor
- Responsibilities of an Expert Witness
- Court Calendar and Subpoenas
- Curriculum vitae (CV) Preparation
- Discovery Requests

7.0 Module 7: Combined DNA Index System (CODIS)

7.1 Background Information and Theory

The Combined DNA Index System (CODIS),established and funded by the Federal Bureau of Investigation (FBI), is a computer software program for the operation of local, state, and national DNA databases. Designed for the storage and searching of STR profiles, the software permits sharing and comparing of qualifying DNA profiles between participating labs. To ensure uniformity for the sharing of information, the FBI has chosen 13 core STR loci to serve as the standard for CODIS. A weekly search is conducted of all DNA profiles in the National DNA Index System (NDIS) and the submitting laboratories are notified of potential matches automatically.

Each state determines its own policies concerning samples allowed in the state database, via legislation regarding the database creation and use. The designated CODIS Administrator serves as the CODIS point of contact and as gatekeeper for the data from the state database into NDIS. Laboratories that contribute to NDIS must comply with NDIS Procedures, which includes rules that govern DNA profile uploads. Some sample categories and profiles that don't meet a minimum number of loci are not eligible for entry into NDIS. The eligible DNA categories or indexes include, but are not limited to, convicted offenders, forensic unknowns (from crime scene evidence), and missing persons.

Forensic profiles from both solved and unsolved cases are entered into the databases in an effort to assist law enforcement agencies in solving or linking crimes that may not have otherwise resulted in the identification of a suspect. The effectiveness of the databases lies in the concept that many crimes are committed by repeat offenders. As the databases grow in size the effectiveness will also increase.

7.2 Objectives

To gain the knowledge base and skills necessary to enter and maintain DNA profiles in CODIS. This will include but is not limited to the following: CODIS software operation and hierarchy, understanding sample eligibility requirements,

security procedures, review requirements, accepted specimen categories and indexes, and minimum number of loci requirements. Upon successful completion of this module, the trainee will be able to determine whether a given profile (including mixtures) may be entered/uploaded into the database and when, identify the core loci, enter samples through STR data entry and/or using the import function, and perform keyboard searches as necessary.

7.3 Practical Exercises

Reading, observation of individual procedures (documented on the observation log), and the supervised tasks listed below. All reading and observations must be completed, and the trainee must be approved to begin supervised DNA casework or independent database analysis, prior to performing the supervised tasks. Additionally, NDIS approval must be obtained prior to obtaining login access to the CODIS workstation.

- Enter a minimum of three profiles using STR data entry.
- Locate the specimens entered through STR data entry and print specimen details reports for review by the CODIS Administrator.
- Enter a minimum of two .cmf files using the import function.
- Perform a minimum of two keyboard searches.

7.4 Principles/Knowledge

The analyst should have an understanding of CODIS, which may include but is not limited to the following:

- Utility of DNA Database
- CODIS software
- NDIS eligibility
- Available specimen categories
- Review and documentation requirements prior to search and upload
- Security requirements

8.0 Module 8: Administrative and Technical Review

8.1 Background Information and Theory

Administrative and Technical reviews are an integral part the laboratory's quality assurance system and must be completed on 100% of biology/DNA cases and database packets to ensure the reports issued to customers and data uploaded to CODIS meet all of the laboratory's quality standards. It also ensures the conclusions made are scientifically reasonable and based upon the data obtained. In general the review will verify that all documentation (reports, note packets, worksheets, etc.) is accurate, legible, free of clerical errors and consistent with laboratory protocols. Some specific elements of the review will include, but is not limited to, the following: all testing was accurately documented in the notes and required worksheets; the data generated meets all of the required specifications; the casework report accurately reflects the evidence examined, testing performed, the analysts conclusions, and statistical calculations if appropriate; the evidence chain of custody has been completed; and the profiles to be entered into CODIS meet eligibility requirements. The administrative and technical review must be performed by a second qualified analyst and prior to the release of results and/or entry of data into CODIS.

8.2 Objectives

To gain the knowledge and skills necessary to perform administrative and technical reviews of biology/DNA case files or database packets. Upon successful completion of this module, the trainee will understand the conflict resolution process, elements of both administrative and technical review, proper file/packet organization, and how to properly document the review.

The trainee must have been previously approved to perform and have gained experience performing independent casework or database analysis, as well as received review feedback of his/her cases/database packets prior to beginning this module.

8.3 Practical Exercises

Reading, and mock administrative/technical reviews of case files or database packets. The trainee will perform mock administrative and technical review by flagging the file or packet with a note indicating the specific concern or question. No notations will be made directly on the note packet by the trainee. The flagged file or packet will be given to a qualified analyst/reviewer for the official review. The qualified reviewer will evaluate the trainee's notes and discuss any discrepencies in findings observed.

8.4 Principles/Knowledge

The analyst should have an understanding of the process and requirements of administrative and technical review, which may include but is not limited to the following:

- Documentation of Review (notations/worksheets)
- Conflict Resolution Process
- Documentation of Corrections Made to Files
- Case File Organization

Form 100-TR

ISP Forensic Biology
Training Evaluation Form
Module 1: Laboratory Introduction

Trainee:_____

Required Reading:
Books/Manuals

Date Completed	
☐	ISP Employee Handbook ('red tab' policies; Use of Information Technology Policies; relevant forms)
☐	ISP Strategic Plan
☐	ISP Forensic Services Quality/Procedure Manual (Rev.#_____)
☐	ISP Forensic Services Health and Safety Manual (Rev.#_____)
☐	ISP Forensic Biology Quality Manual(Rev.#_____)
☐	Saferstein, Richard, Criminalistics: An Introduction to Forensic Science, Ninth Edition, Chapter 1: Introduction, pp. 2-29, Pearson Prentice Hall, 2007 (or most recent edition available)

Practical Exercises:

Date Completed		
	Other Forensic Discipline Training *(indicate if obtained through reading, observation, conversations, online training, and/or coursework)*	
☐	Crime Scene	_____
☐	Biology/DNA Casework	_____
☐	Offender Database	_____
☐	Controlled Substances	_____
☐	Fire Debris	_____
☐	Firearms/Toolmarks	_____
☐	Footwear/Tiretracks	_____
☐	Latent Prints	_____
☐	Toxicology	_____

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Date Completed

☐ _____ Blood/Breath Alcohol _____

☐ _____ Ethics in Forensic Science *(indicate online course, lecture, reading, and/or coursework; at a minimum must include the currently approved course)* _____

Competency:

Date Completed

☐ _____ Quality Manual Examination

☐ _____ Health and Safety Manual Examination

☐ _____ Written Examination

Comments:

Successful Completion of Module 1

_____/_____
Trainee Signature Date

_____/_____
Trainer Signature Date

_____/_____
Technical Leader Signature Date
(If different than Trainer)

Revision 1
9/6/2011
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Form 100-TR

ISP Forensic Biology
Training Evaluation Form
Module 2: Evidence/Offender Sample Handling

Trainee:_____

Required Reading:

Books/Manuals

Date Completed	
☐	Review relevant evidence sections of the ISP Forensic Services Quality/Procedure Manual(Rev.#_____) and ISP Forensic Biology Quality Manual (Rev.#_____)
	or
☐	Review relevant Tracker sections of the ISP Forensic Biology Database Analytical Methods (Rev.#_____)

Papers

Date Completed	
☐	Kaye, J.A. Correspondence About Handling Evidence in cases of Acquired Immune Deficiency Syndrome (AIDS) [letter] American Journal of Forensic Medicine and Pathology, March, 1986; 7(1):87-88.

Practical Exercises:

Casework

Date Completed	
☐	Observe analyst(s) receiving/returning/submitting evidence, updating backlogs, maintaining/documenting the chain of custody, and using the evidence tracking or laboratory information system

Database

Date Completed	
☐	Observe analyst(s) receiving/entering/storing offender samples and court orders, checking offenses, and using the Tracker System

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Competency:

Casework

Date Completed

☐ Written Examination

Database

Date Completed

☐ Written Examination
☐ Supervised Offender/Court Order Receipt, Offense Confirmation, and Tracker Entry
min. #___ offender samples
min. #___ court orders

Comments:

Successful Completion of Module 2

_____/_____
Trainee Signature Date

_____/_____
Trainer Signature Date

_____/_____
Technical Leader Signature Date
(If different than Trainer)

Form 100-TR

ISP Forensic Biology
Training Evaluation Form
Module 3: Supplies, Quality Control, and Reagents

Trainee:_____

Required Reading:
Books/Manuals

	Date Completed	
☐		Review relevant facilities, chemicals/reagents, and equipment sections of the ISP Forensic Biology Quality Manual (Rev.#_____)
☐		Review relevant section of the ISP Forensic Services Health and Safety Manual (Rev.#_____)
☐		MSDS for reagents in Biology Section
☐		Approved chemicals/incompatibilities list
☐		Approved supplies/services list
☐		P-card procedures

Practical Exercises:

	Date Completed	
☐		Observe analyst(s) preparing "in-house" reagents and calibrating the pH meter
☐		Observe analyst(s) ordering and receiving laboratory supplies
☐		Weekly QC
☐		Monthly non-instrumental QC
☐		Quarterly non-instrumental QC

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Competency:

Date Completed

- ☐ Written Examination
- ☐ Calibrate pH meter
- ☐ Prepare a minimum of three 'in-house' reagents
- ☐ Order and receive laboratory supplies

Comments:

Successful Completion of Module 3

_____/_____
Trainee Signature Date

_____/_____
Trainer Signature Date

_____/_____
Technical Leader Signature Date
(If different than Trainer)

Form 100-TR

ISP Forensic Biology
Training Evaluation Form
Module 4: Biological Screening

Trainee: _____

Required Reading:

Books/Manuals

Date Completed	
☐	Review relevant screening sections of the ISP Forensic Biology Casework Analytical Methods (Rev.#___)
☐	Review relevant documentation and reporting section of the ISP Forensic Biology Quality Manual (Rev.#___)
☐	Relevent product inserts and/or technical manuals
☐	Bunker, Judith, Bloodstain Evidence Manual, Vol.3: Identification Stain and Pattern Characteristics, Institute of Applied Forensic Technology, Dojo's Press, 1998.
☐	Saferstein, Richard, Criminalistics: An Introduction to Forensic Science, Ninth Edition, Chapter 1: Introduction, pp. 2-29, Pearson Prentice Hall, 2007 (or most recent edition available).
☐	Sensabaugh, G., The Utilization of Polymorphic Enzymes in Forensic Science. Isozymes: Current Topics in Biological and Medical Research Volume 11: Medical and Other Applications.1983, 137-154.
☐	Forensic Science Handbook, Vol.I, Second Edition, Chapter 10: Modern Forensic Biology, pp.527-552, Prentice-Hall, 2002.
☐	Forensic Science Handbook, Vol.II, Second Edition, Chapter 8: The Identification of Semen and Other Body Fluids, pp.329-399, Pearson Prentice-Hall, 2005.
☐	Sourcebook in Forensic Serology, Immunology and Biochemistry (relevant sections on identification of various body fluids), U.S. Department of Justice, NIJ, 1983.

Form 100-TR

Papers

Date Completed

☐ Brauner, P. and Gallili, N. A Condom--the Critical Link in a Rape. Journal of Forensic Sciences, September 1993; 38(5):1233-1236.

☐ Bryson, C.K., Garlo, A.M. and Piner, S.C. Vaginal Swabs: endogenous and postcoital components. Journal of the Forensic Science Society, May-June 1989; 29(3): 157-171.

☐ Cox, M. A Study of the Sensitivity and Specificity of Four Presumptive Tests for Blood. Journal of Forensic Sciences, September 1991; 36(5):1503-1511.

☐ Duenhoelter, J.H.; Stone, I.C.; Santos-Ramos, R. and Scott, D.E. Detection of Seminal Fluid Constituents After Alleged Sexual Assault. Journal of Forensic Sciences, October 1978; 23(4):824-829.

☐ Gabby, T.; Winkleby, M.A.; Boyce, W.T.; Fisher, D.L.; Lancaster, A. and Sensabaugh, G.F. Sexual Abuse of Children. The Detection of Semen on Skin. American Journal of Diseases of Children, June 1992; 146(6):700-703.

☐ Hochmeister, M.N.; Budowle, B.; Rudin, O.; Gehrig, C.; Borer, U.; Thali, M. and Dirnhofer, R. Evaluation of Prostate-specific Antigen (PSA) Membrane Test Assays for the Forensic Identification of Seminal Fluid. Journal of Forensic Sciences, September 1999; 44(5):1057-1060.

☐ Kamenev, L.; LeClercq, M. and Francois-Gerard, Ch. Detection of p30 antigen in sexual assault case material. Journal of the Forensic Science Society, July-August 1990; 30(4):193-200.

☐ Linch, C.A.; Smith, S.L. and Prahlow, J.A. Evaluation of the Human Hair Root for DNA Typing Subsequent to Microscopic Comparison. Journal of Forensic Sciences, March 1998; 43(2):305-314.

☐ Sensabaugh, G.F. Isolation and Characterization of a Semen-specific Protein from Human Seminal Plasma: a Potential New Marker for Semen Identification. Journal of Forensic Sciences, January 1978; 23(1):106-115.

Date Completed

☐ Willott, G.M., An Improved test for the Detection of Salivary Amylase in Stains. Journal of the Forensic Science Society, October 1974; 14(4): *itu* Using Cotton Swabs and Bromochoroindolyl341-344.

☐ Willott, G.M. and Crosse, M.A. The Detection of Spermatozoa in the Mouth. Journal of the Forensic Science Society, March-April 1986; 26(2): 125-128.

☐ Auvdel, M.J. Amylase Levels in Semen and Saliva Stains. Journal of Forensic Sciences, April 1986; 31(2):426-431.

☐ Chapman, R.L., Brown N.M., and Keating, S.M. The isolation of spermatozoa from sexual assault swab using Proteinase K. Journal of the Forensic Science Society, May-June 1989; 29(3): 207-212.

☐ Cox, M. Effect of Fabric Washing on the Presumptive Identification of Bloodstains. Journal of Forensic Sciences, November 1990; 35(6):1335-1341.

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Form 100-TR

Date Completed

☐ Joshi, U.N.; Subhedar, S.K. and Saraf, D.K. Effect of Water Immersion on Seminal Stains on Cotton Cloth. Forensic Science International, January-February 1981; 17(1):9-11.

☐ Kafarowski, E.; Lyon, A.M. and Sloan, M.M. The Retention and Transfer of Spermatozoa in Clothing by Machine Washing. Canadian Society of Forensic Science Journal, 1996; 29(1):7-11.

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☐ Sato, K.; Tsutsumi, H.; Htay, H.H.; Tamaki, K.; Okajima, H. and Katsumata, Y. Identification of Human Urinary Stains by the Quotient Uric Acid/Urea Nitrogen. Forensic Science International, March 1990; 45(1-2):27-38.

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☐ Spear, T. and Khoshkebari, N. Analysis of Old Biological Samples: A Study on the Feasibility of Obtaining Body Fluid Identification and DNA Typing Results. California Criminalistics Institute.

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Date Completed

☐ Sweet, D. and Shutler, G.G. Analysis of Salivary DNA Evidence from a Bite Mark on a Body Submerged in Water. Journal of Forensic Sciences, September 1999; 44(5): 1069-1072.

☐ Tobe, S.S. et al. Evaluation of Six Presumptive Tests for Blood, Their Specificity, Sensitivity, and Effect on High Molecular-Weight DNA. Journal of Forensic Sciences, 2007; 52(1):102-109.

Practical Exercise:

Date Completed

☐ Alternate light source safety training

Presumptive Blood Tests

☐ Blood dilutions
☐ Aged bloodstains
☐ Body fluids
☐ Fruits/vegetables

Presumptive Semen Tests

☐ Semen dilutions
☐ Mapping
☐ Aged semen
☐ Body fluids
☐ Fruits/vegatables

Saliva Tests

☐ Saliva dilutions
☐ Substrates
☐ Body fluids

Urine Tests

☐ Urine dilutions
☐ Body fluids

Feces Tests

☐ Body fluids/animals
☐ Microscopic exam

Form 100-TR

Date Completed

Stain Detection Exercises

- ☐ ALS stains
- ☐ ALS substrates
- ☐ IR cameras
- ☐ Stereomicroscope

Microscopic Exam for Sperm

- ☐ Animal sperm
- ☐ Neat semen (stained vs. unstained)
- ☐ Semen dilutions
- ☐ Body fluids and post-coital

Proteinase 30

- ☐ Semen dilutions
- ☐ Post-coital
- ☐ Body fluids

Hematrace

- ☐ Blood dilutions
- ☐ Aged bloodstains
- ☐ Body fluids and animals

☐ Case file review

☐ Hands of the Analyst

☐ Mock Cases

☐ p30 kit QC

☐ HematraceKit QC

Form 100-TR

Competency:

Date Completed

☐ Written Examination

☐ Biology Screening Practical Competency Test (mock case, unknown stain sheet, etc.)

☐ Supervised Cases
min. #___ 'kit only' cases
min. #___ multi-item sexual assault cases
min. #___ blood cases

Note: approval to perform supervised cases must be obtained from the Quality Manager and will be after completion of all other requirements)

Comments:

Successful Completion of Module 4

_____/_____
Trainee Signature Date

_____/_____
Trainer Signature Date

_____/_____
Technical Leader Signature Date
(If different than Trainer)

Form 100-TR

ISP Forensic Biology
Training Evaluation Form
Module 5: DNA Analysis

Trainee:_____

Required Reading:
Books/Manuals

Date Completed	
☐	Review relevant facilities, evidence, equipment, and documentation/reporting sections of the ISP Forensic Biology Quality Manual(Rev.#____)
☐	Review relevant DNA sections of the ISP Forensic Biology Casework Analytical Methods (Rev.#____)
	or
☐	Review the ISP Forensic Biology Database Analytical Methods (Rev.#_____)
☐	Applicable product inserts and technical manuals
☐	Applicable Validations/Performance Verifications, including cited literature
☐	Quality Assurance Standards for Forensic DNA Testing Laboratories (FBI) (20___)
	or
☐	Quality Assurance Standards for Convicted Offender DNA Databasing Laboratories (FBI) (20___)
☐	The Evaluation of Forensic DNA Evidence (National Research Council), National Academy Press, Washington, D.C. (1996).
☐	DNA Technology in Forensic Science (National Research Council), National Academy Press, Washington, D.C. (1992).
☐	Butler, J.M. Forensic DNA Typing, Second Edition: Biology, Technology, and Genetics of STR Markers. Academic Press (2005)
☐	PCR: The Polymerase Chain Reaction. BirkHauser Boston (1994)

Revision 1
9/6/2011
Issuing Authority: Quality Manager

Date Completed

☐ Evett, I.W. and Weir, B.S. Interpreting DNA Evidence: Statistical Genetics for Forensic Scientists. Sinauer Associates, Inc. (1998)

☐ Rudin, N., Inman, K. An Introduction to Forensic DNA Analysis, Second Edition. CRC Press (2002)

Papers

Date Completed

☐ Allor, C. et al. Identification and Characterization of Variant Alleles at CODIS STR Loci. Journal of Forensic Sciences, 2005; 50(5):1-6.

☐ Alonso, A. et al. DNA Typing from Skeletal Remains: Evaluation of Multiples and Megaplex STR Systems on DNA Isolated from Bone and Teeth Samples. Croatian Medical Journal, 2001; 42(3):260-266.

☐ Alford, R.L. et al. Rapid and efficient resolution of parentage by amplification of short tandem repeats. American Journal of Human Genetics, 1994 55: 190-195.

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☐ Budowle, B. et al. Population Data on the Thirteen CODIS Core Short Tandem Repeat Loci in African Americans, U.S. Caucasians, Hispanics, Bahamians, Jamaicans, and Trinidadians. Journal of Forensic Sciences, November, 1999; 44(6): 1277-1286.

☐ Budowle, B. et al. Source Attribution of a Forensic DNA Profile. Forensic Science Communications, July, 2000; 2(3).

☐ Budowle, B. et al. STR Primer Concordance Study. Forensic Science International, December 15, 2001; 124(1):47-54.

☐ Buel, E. et. al. Capillary Electrophoresis STR Analysis: Comparison to Gel-Based Systems. Journal of Forensic Sciences, 1998; 43(1):164-170.

Date Completed

☐ Butler, J.M. et al. Application of dual internal standards for precise sizing of polymerase chain reaction products using capillary electrophoresis. Electrophoresis, 1995; 16: 974-980.

☐ Butler, J.M. Genetics and Genomics of Core Short Tandem Repeat Loci Used in Human Identity Testing. Journal of Forensic Sciences, 2006; 5(2):253-265.

☐ Butler, J.M. New Resources for the Forensic Genetics Community Available on the NIST STRBase Website. Forensic Science International: Genetics, 2008; 1(1):97-99.

☐ Chakraborty, R. et al. The utility of short tandem repeat loci beyond human identification: Implications for development of new DNA typing systems. Electrophoresis, 1999 20(8):1682-1696.

☐ Crouse, C. et al. Analysis and interpretation of short tandem repeat microvariants and three banded allele patterns using multiple allele detection systems. Journal of Forensic Sciences, 1999; 44(1):87-94.

☐ Edwards, M.C. and Gibbs, R.A. Multiplex PCR: advantages, development, and applications. PCR Meth. Appl. 1994; 3: S65-S75.

☐ Ensenberger, M.G. et al. Developmental Validation of the PowerPlex®16 HS System: An Improved 16-locus fluorescent STR Multiplex. Forensic Science International: Genetics, 2010; 4(4):257-264.

☐ Fowler, J.C. et al. Repetitive Deoxyribonucleic Acid (DNA) and Human Genome Variation--a Concise Review relevant to Forensic Biology. Journal of Forensic Sciences, 1988; 33():1111-1126.

☐ Gill, P. et al. DNA Commission on the International Society of Forensic Genetics: Recommendation on the Interpretation of Mixtures. Forensic Science International, July 2006; 160(2): 90-101.

☐ Graham, E.A.M. et al. Can Post-Mortem Blood Be Used for DNA Profiling After Peri-Mortem Blood Transfusion? International Journal of Legal Medicine, 2007; 121:18-23.

☐ Green, R.L. et al. Developmental Validation of the Quantifiler Real-Time PCR Kits for the Quantification of Human Nuclear DNA Samples. Journal of Forensic Sciences, 2005; 50(4):1-15.

Form 100-TR

Date Completed

☐ Greenspoon, S.A. et al. Application of the BioMek® 2000 Laboratory Automation Workstation and the DNA IQ™ System to the Extraction of Forensic Casework Samples, January, 2004; 49(1):1-11.

☐ Greenspoon, S.A. et al. Automated PCR Setup for Forensic Casework Samples Using the Normalization Wizard and PCR Setup Robotic Methods. Forensic Science International, December 2006; 164(2):240-248.

☐ Gusmao, L. et al. DNA Commission of the International Society of Forensic Genetics (ISFG): An Update of the Recommendations on the Use of Y-STRs in Forensic Analysis. International Journal of Legal Medicine, 2006; 120(4):191-200.

☐ Horsman, K.M. et al. Forensic DNA Analysis on Microfluidic Devices: A Review. Journal of Forensic Sciences, 2007; 52(4): 784-798.

☐ Jeffreys, A.J.; Wilson, V. and Thein, S.L. Individual-specific 'fingerprints' of Human DNA. Nature, December 12-18, 1985; 318(6046):577-579.

☐ Koukoulas, I. et al. Quantifiler™ Observation of Relevance to Forensic Casework. Journal of Forensic Sciences, 2008; 53(1):135-141.

☐ Krenke, B.E. et al. Developmental Validation of a Real-Time PCR Assay for the Simultaneous Quantification of Total Human and Male DNA. Forensic Science International: Genetics, December 2008; 3(1):14-21.

☐ Mansfield, E.S. et al. Sensitivity, reproducibility, and accuracy in short tandem repeat genotyping using capillary array electrophoresis. Genome Research, 1996; 6: 893-903.

☐ McEwen, J.E. Forensic DNA data banking by state crime laboratories. American Journal of Human Genetics, 1995; 56: 1487-1492.

☐ McLaren,B. et al. Automating the DNA IQ™ System on the Biomek® 3000 Laboratory Automation Workstation. Profiles in DNA, Promega 2006.

Form 100-TR

Date Completed

☐ Montpetit, S.A. et al. A Simple Automated Instrument for DNA Extraction in Forensic Casework. Journal of Forensic Sciences, 2005; 50(3):1-9.

☐ Opel, K.L. et al. Evaluation and Quantification of Nuclear DNA from Human Telogen Hairs. Journal of Forensic Sciences, 2008; 53(4):853-857.

☐ Paoletti, D.R. et al. Empirical Analysis of the sTR Profiles Resulting from Conceptual Mixtures. Journal of Forensic Sciences, 2005; 50(6):1-6.

☐ Petricevic, S.F. et al. DNA Profiling of Trace DNA Recovered from Bedding. Forensic Science International, May 2006; 159(1):21-26.

☐ Phipps, M. and Petricevic, S. The Tendency of Individuals to Transfer DNA to Handled Items. Forensic Science International, May 2007; 168(2):162-168.

☐ Roby, R.K. et al. The National Institute of Justice's Expert Systems Testbed Project. Proceedings of the 16th International Symposium on Human Identification, November 2005, Promega Corporation.

☐ Romero, R.B. et al. The applicability of formalin-fixed and formalin fixed paraffin embedded tissues in forensic DNA analysis Journal of Forensic Sciences, 1997; 42(4):708-714.

☐ Scherczinger, C.A. et al. A Systematic Analysis of PCR Contamination. Journal of Forensic Sciences, 1999; 44(5):1042-1045.

☐ Soares-Viera, J.A. et al. Y-STRs in Forensic Medicine: DNA Analysis in Semen Samples of Azoospermic Individuals. Journal of Forensic Sciences, 2007; 52(3):664-670.

☐ Soborino, B. et al. SNPs in Forensic Genetics: A Review on SNP Typing Methodologies. Forensic Science International. November 2005; 154(2); 181-194.

☐ Spear, T. et al. Fingerprints & Cartridge Cases: How Often are Fingerprints Found on Handled Cartridge Cases and Can These Fingerprints Be Successfully Typed for DNA? California Criminalistics Institute.

Form 100-TR

Date Completed

☐ Spear, T. et al. Summary of Experiments Investigating the Impact of Fingerprinting Processing and Fingerprint Reagents on PCR-based DNA Typing Profiles. California Criminalistics Institute.

☐ Swango, K.L. et al. A quantitative PCR Assay for the Assessment of DNA Degradation in Forensic Samples. Forensic Science International, April 2006; 158(1):14-26.

☐ Valasek, M.A.; Repa, J.J. The Power of Real-Time PCR. Advances in Physiology Education, 2005; 29(3):151-159.

☐ vanOorschot, R.A.H. et al. Beware of the Possibility of Fingerprinting Techniques Transferring DNA. Journal of Forensic Sciences, 2005; 50(6):1-6.

☐ Walsh, P.S.; Erlich, H.A. and Higuchi, R. Preferential PCR amplification of alleles: Mechanisms and solutions. PCR Meth. Appl. 1992; 1: 241-250.

☐ Walsh, S.J., et.al. Comparing the Growth and Effectiveness of Forensic DNA Databases. Forensic Science International: Genetics, 2008; 1(1):667-668.

☐ Weir, B.S. Matching and Partially-Matching DNA Profiles. Journal of Forensic Sciences, 2004; 49(5):1-6.

☐ Wilson, M.R. et al Guidelines for the Use of Mitochondrial DNA Sequencing in Forensic Science. Crime Laboratory Digest, 1993; 20(4):68-77.

☐ Wilson, M.R. et al Validation for Mitochondrial DNA Sequencing for Forensic Casework Analysis. International Journal of Legal Medicine, 1995; 108(2):68-74.

☐ Yoshida, K. et al. The Modified Method of Two-step Differential Extraction of Sperm and Vaginal Epithelial Cell DNA from Vaginal Fluid Mixed with Semen. Forensic Science International, March 21, 1995; 72(1):25-33.

Form 100-TR

Practical Exercises:

Casework

Date Completed		
		Liquid Blood
☐		Extraction
☐		Quantitation
☐		Amplification
☐		CE/Data Analysis
		Dilution Series
☐		EZ1 Extraction
☐		Organic Extraction
☐		Chelex Extraction
☐		Quantitation
☐		Amplification
☐		CE/Data Analysis
		Body Fluids
☐		Extraction
☐		Quantitation
☐		Amplification
☐		CE/Data Analysis
		Family Samples
☐		Extraction
☐		Quantitation
☐		Amplification
☐		CE/Data Analysis
☐		Statistics
		Mixtures
☐		Extraction
☐		Quantitation
☐		Amplification
☐		CE/Data Analysis
☐		Statistics

Form 100-TR

Date Completed

Post-Coital

- ☐ EZ1 Extraction
- ☐ Organic Extraction
- ☐ Quantitation
- ☐ Amplification
- ☐ CE/Data Analysis
- ☐ Statistics

Quantitation/Real-time PCR

- ☐ Standards
- ☐ Dilution Series
- ☐ Extraction Controls

PCR Amplification Setup

- ☐ Dilution Series
- ☐ High Concentration Samples

Capillary Electrophoresis/Data Analysis

- ☐ Manual Genotyping
- ☐ Instrument Setup
- ☐ Sensitivity Dilution Series
- ☐ High Concentration Samples

☐ Case File Review

☐ Mock Cases

Database

Date Completed

Extraction Method Plate

- ☐ FTA Extraction
- ☐ Manual DNA IQ Extraction
- ☐ Automated DNA IQ Extraction
- ☐ Quantitation
- ☐ Amplification
- ☐ CE/Data Analysis

Form 100-TR

Date Completed

Checkerboard Plate
- ☐ Extraction
- ☐ Quantitation
- ☐ Amplification
- ☐ CE/Data Analysis

Elution Volume Plate
- ☐ Extraction 50ul
- ☐ Extraction 100ul
- ☐ Quantitation
- ☐ Amplification
- ☐ CE/Data Analysis

Quantitation/Real-time PCR
- ☐ Standards
- ☐ Dilution Series
- ☐ Extraction Controls

PCR Amplification Setup
- ☐ Dilution Series
- ☐ High Concentration Samples

Capillary Electrophoresis/Data Analysis
- ☐ Manual Genotyping
- ☐ Instrument Setup
- ☐ Sensitivity Dilution Series
- ☐ High Concentration Samples

- ☐ Previously Typed Offenders

Quality Control

Date Completed

- ☐ Quantitation Kit QC
- ☐ Amplification Kit QC
- ☐ Monthly Instrument QC
- ☐ Quarterly Instrument QC

Form 100-TR

Competency:

Date Completed

☐ Written Examination

☐ DNA Casework Practical Competency Test (mock case, previously analyzed proficiency test, etc.)

☐ Supervised DNA Cases
min. #___ sexual assault cases
min. #___ blood cases

Note: approval to perform supervised cases must be obtained from the Quality Manager and will be after completion of all other requirements)

☐ DNA Database Practical Competency Exam (mock database samples, previously analyzed offender samples, previously analyzed proficiency test, etc.)

Comments:

Successful Completion of Module 5

_____/_____
Trainee Signature Date

_____/_____
Trainer Signature Date

_____/_____
Technical Leader Signature Date
(If different than Trainer)

Form 100-TR

ISP Forensic Biology
Training Evaluation Form
Module 6: Court: Decisions and Testimony

Trainee: _____

Required Reading:

Books/Manuals

Date Completed	
☐	Forensic Science Handbook, Vol.I, Second Edition, Chapter 1: Legal Aspects of Forensic Science, pp.4-39, Prentice-Hall, 1982.
☐	Forensic Science Handbook, Vol.III, Chapter 1: Legal Standards for Admissibility of Novel Scientific Evidence, pp.1-23, Regents/Prentice-Hall, 1993.
☐	Admissibility Packet: Frye Standard, Federal Rules of Evidence, Kelly Three-Prong Test, Daubert Standard, Idaho Rules of Evidence.
☐	Idaho State Judiciary, Idaho Court Rules: Idaho Rules of Civil Procedure, Idaho Criminal Rules, Idaho Rules of Evidence. http://www.isc.idaho.gov/rulestxt.htm
☐	Becker, Ronald F., Scientific Evidence and Expert Testimony Handbook: A Guide for Lawyers, Criminal Investigators and Forensic Specialists, Charles C. Thomas Publishers, Limited, 1997.
☐	Matson, Jack V., Effective Expert Witnessing, 3rd Edition, Lewis Publishers/CRC Press, 1998.

Papers

Date Completed	
☐	Peterson, Joseph L. Symposium: Ethical Conflicts in the Forensic Sciences, Introduction. Journal of Forensic Sciences, May 1989; 34(3):717-718.
☐	Lucas, Douglas M. Symposium: Ethical Conflicts in the Forensic Sciences, The Ethical Responsibilities of the Forensic Scientist: Exploring the Limits. Journal of Forensic Sciences, May 1989; 34(3):719-729.

Form 100-TR

Date Completed

- ☐ Giannelli, Paul, C. Symposium: Ethical Conflicts in the Forensic Sciences, Evidentiary and Procedural Rules Governing Expert Testimony. Journal of Forensic Sciences, May 1989; 34(3):730-748.
- ☐ Peterson, Joseph L. and Murdock, John E. Symposium: Ethical Conflicts in the Forensic Sciences, Forensic Science Ethics: Developing an Integrated System of Support and Enforcement. Journal of Forensic Sciences, May 1989; 34(3):749-762.
- ☐ Frankel, Mark S. Symposium: Ethical Conflicts in the Forensic Sciences, Ethics and the Forensic Sciences: Professional Autonomy in the Criminal Justice System. Journal of Forensic Sciences, May 1989; 34(3):763-771.
- ☐ Saks, Michael J. Symposium: Ethical Conflicts in the Forensic Sciences, Prevalence and Impact of Ethical Problems in Forensic Science. Journal of Forensic Sciences, May 1989; 34(3):772-793.
- ☐ Sognnaes, Reidar F. Symposium: Effective Expert Testimony, Introduction. Journal of Forensic Sciences, April 1983; 28(2):516-522.
- ☐ Miller, Thomas H. Symposium: Effective Expert Testimony, Nonverbal Communication in Expert Testimony. Journal of Forensic Sciences, April 1983; 28(2):523-527.
- ☐ Rosenthal, Paul Symposium: Effective Expert Testimony, Nature of Jury Response to the Expert Witness. Journal of Forensic Sciences, April 1983; 28(2):528-531.
- ☐ Sereno, Kenneth K. Symposium: Effective Expert Testimony, Source Credibility. Journal of Forensic Sciences, April 1983; 28(2):532-536.
- ☐ Koehler, J.J. Error and Exaggeration in the Presentation of DNA Evidence at Trial. Jurimetrics Journal, 1993; 34:21-39.
- ☐ Nordby, Jon J., Can We Believe What we See, if we See is What we Believe?-Expert Disagreement. Journal of Forensic Sciences, July 1992; 37(4):1115-1124.
- ☐ Saks, M.J.; Koehler, J.J. The Coming Paradigm Shift in Forensic Identification Science. Science, August 2005; 309:892-895
- ☐ Slap, Albert J. and Fessenden, Marti. Are Forensic Experts an Endangered Species? Journal of Forensic Sciences, May 1991; 36(3):714-721.

Form 100-TR

Date Completed

☐ Walsh, S.J. Legal Perceptions of Forensic DNA Profiling Part I: A Review of the legal Literature. Forensic Science International, December 2005; 155(1):51-60.

Practical Exercises:

Date Completed

☐ Prepare curriculum vitae

☐ Observe analyst(s) testimony (as available)- Biology

☐ Observe analyst(s) testimony (as available)- DNA

☐ Attend a testimony course (as available)

Competency:

Date Completed

☐ Biology Screening Mock Court

☐ DNA Mock Court

Comments:

Successful Completion of Module 6

_____/_____
Trainee Signature Date

_____/_____
Trainer Signature Date

_____/_____
Technical Leader Signature Date
(If different than Trainer)

Form 100-TR

ISP Forensic Biology
Training Evaluation Form
Module 7: Combined DNA Index System

Trainee: _____

Required Reading:
Books/Manuals

Date Completed	
☐	ISP CODIS Procedures Manual(Rev.#_____)
☐	NIDS Procedures
☐	NDIS Specimen Eligibility and Hit Counting Flow Charts

Practical Exercises:

Date Completed	
☐	STR Data Entry
☐	Specimens Details Reports
☐	Import files
☐	Keyboard Searches

Competency:

Date Completed	
☐	Written Exam
☐	NDIS Eligibility Exam

Revision 1
9/6/2011
Issuing Authority: Quality Manager

Form 100-TR

Comments:

Successful Completion of Module 7

_____/_____
Trainee Signature Date

_____/_____
Trainer Signature Date

_____/_____
Technical Leader Signature Date
(If different than Trainer)

Form 100-TR

ISP Forensic Biology
Training Evaluation Form
Module 8: Administrative and Technical Review

Trainee:_____

Required Reading:
Books/Manuals

Date Completed	
☐	Read relevant review sections of ISP Forensic Biology Quality Manual(Rev.#_____)

Practical Exercises:

Date Completed	
☐	Mock Casework Review (min. #___ cases)
☐	Mock Database Review (min. #___plates)

Competency:

Date Completed	
☐	Written Exam
☐	Biology Screening Review Competency Test (Case # _____)
☐	DNA Casework Review Competency Test (Case # _____)
☐	DNA Database Review Competency Test (Plate # _____)

Revision 1
9/6/2011
Issuing Authority: Quality Manager

Form 100-TR

Comments:

Successful Completion of Module 8

_____ / _____
Trainee Signature Date

_____ / _____
Trainer Signature Date

_____ / _____
Technical Leader Signature Date
(If different than Trainer)

Idaho State Police
Forensic Services

Approval for Quality System Controlled Documents

Discipline/Name of Document: Biology Quality Manual

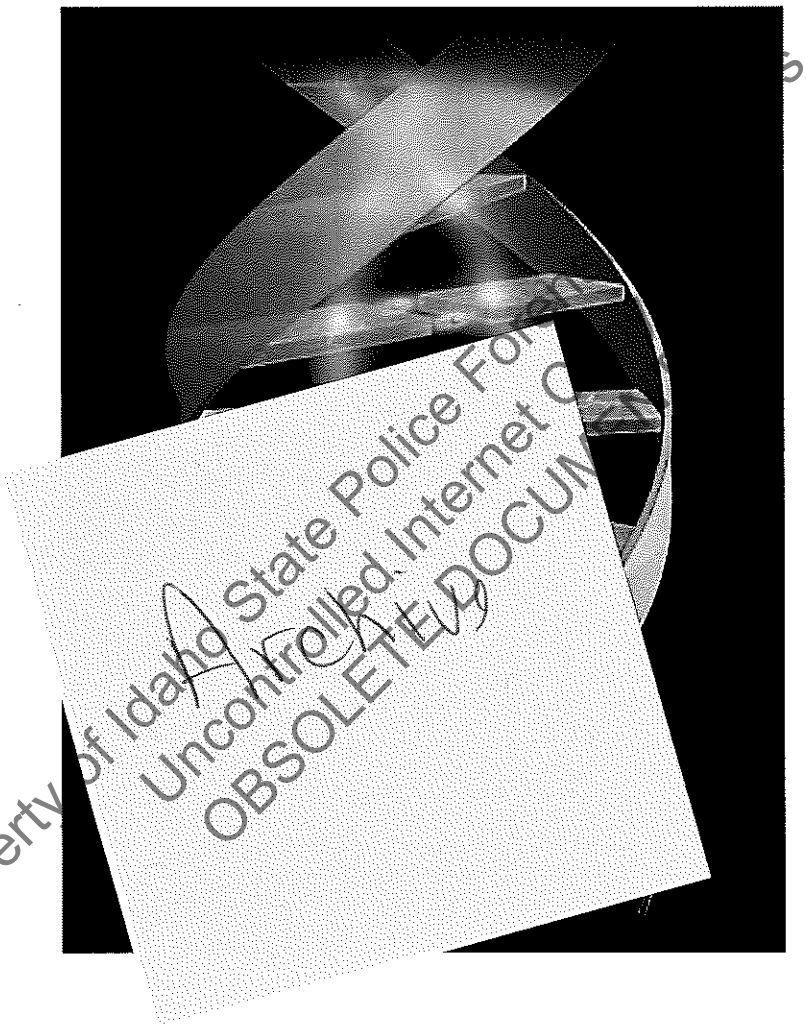
Revision Number: 12

Issue Date: 12/08/2011

APPROVED BY: _____ 12/7/2011
Quality Manager — Date Signed

Checklist Submitted and Checked _____

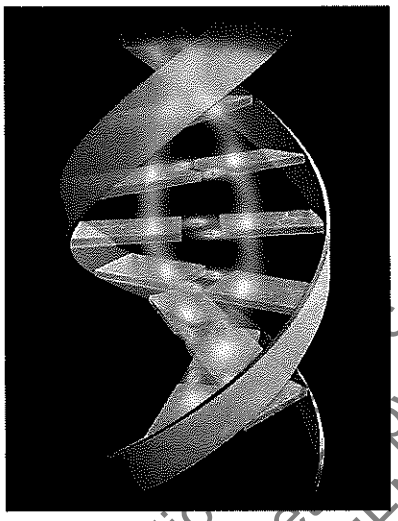
ISP FORENSIC BIOLOGY QUALITY MANUAL



Revision 12
12/7/11
Issuing Authority: Quality Manager

Forensic Biology Quality Manual

Revision #12



APPROVED
December 7, 2011

Cynthia Cunnington
Forensic Scientist IV
Forensic Biology Supervisor/Technical Leader

Forensic Biology Quality Manual

REVISION RECORD

The following table must be filled out when revisions to the Biology Quality/Procedure Manual are made.

Date: The date the revision(s) was completed/effective date.
Revision #: The manual revision number.
Description: A brief description of the changes made to the manual.
Addition: This column is checked if the revision reflects an addition (e.g. new SOP or form) to the manual.
Deletion: This column is checked if the revision reflects a deletion (e.g. SOP or form no longer in use) from the manual.
Initials: Initials of the Technical Leader making the revisions.

Date	Revision #	Description	Addition	Deletion	Initials
8/10/09	9	Updated Quality Policies and forms/methods lists, added contingency plan and FBI quality assurance documents as appendices, separated quality/casework methods/database methods into three separate manuals, added database forms and renumbered methods/forms, updated QC functions, fixed clerical errors throughout	X		CRH
11/29/10	10	Updated 3130 references to include 3130xl, separated biology and database labs, updated CODIS security and review to reflect current NDIS procedures, renamed vault fridges/freezers, changed eye wash check to monthly			CRC
8/29/11	11	Added forms 316-BI, 404C-QC, and 406C-QC (separated casework and database QC's), defined thermal cycler performance check, allowed for FBI on-site visit for outsourcing, clarified evidence numbering scheme and need to refer to return of empty packaging in reports, report wording so blood not required reference, clerical errors	X		CRC
12/7/11	12	Removed 310 references, renumbered CODIS methods, change to casework packet order/binding.			CRC

Forensic Biology Quality Manual
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INTRODUCTION

The Forensic Biology Quality and Procedure Manuals are not public documents. Copies of the manuals, or portions thereof, will be released only to individuals having official business and upon proper discovery requests relating to a specific case(s).

1.0 STATEMENT OF PURPOSE AND OBJECTIVES

1.1 Statement of Purpose: ISP Forensic Biology exists to provide quality, unbiased and cost-effective analyses in the identification of biological substances and their source(s) relevant to the investigation and prosecution of criminal offenses in Idaho. The ISP Forensic Biology Quality Manual, along with the ISP Forensic Services Quality/Procedure Manual, provide the framework for the evaluation of QC (Quality Control) measures utilized in Forensic Biology to achieve that purpose. A system-wide mission and objectives are enumerated in the ISP Forensic Services Quality/Procedure Manual.

1.2 Objectives:

1.2.1 To develop and maintain, through annual review and revision (where necessary), a system of quality procedures, analytical methods, and controls to ensure quality up-to-date personnel training, biological screening and DNA analyses.

1.2.2 To evaluate (and revise where appropriate) through proficiency testing, audits, and other means of review, the thoroughness and effectiveness of biology personnel training, procedures and QC measures.

1.2.3 To remain scientifically neutral by basing case/evidence acceptance and analysis decisions, case reports and testimony solely on sound scientific rationale.

1.2.4 To develop and use practices that respect and protect the right of privacy for the genetic profiles developed in forensic casework or for database entry.

1.2.5 To provide high quality training, technical and informational assistance, biological analyses, written reports and testimony.

1.2.6 To provide all services in a cost-effective and timely manner.

2.0 ORGANIZATION AND MANAGEMENT

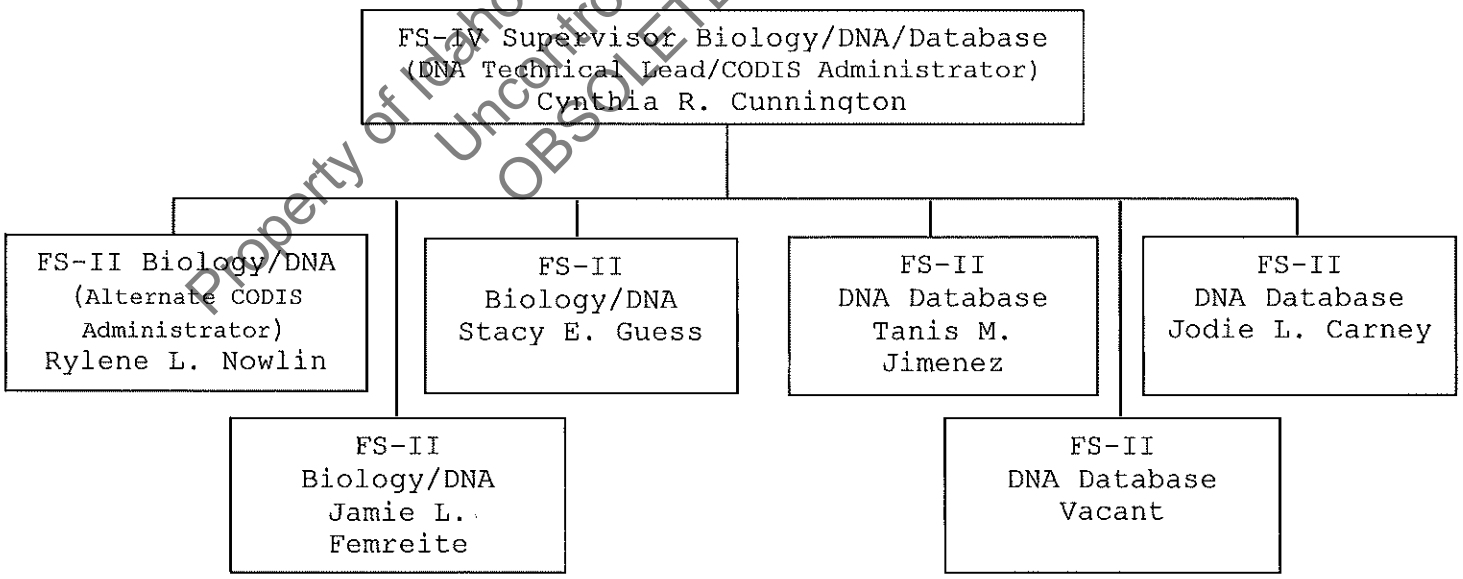
2.1 Organizational Chart and Functional Structure

2.1.1 An organizational chart for ISP Forensic Services appears in the ISP Forensic Services Quality/Procedure Manual. The Forensic Biology organization is delineated below.

2.1.2 An organizational chart for the Idaho State Police appears in the ISP Policy Manual.

2.2 Authority and Accountability in Forensic Biology

2.2.1 The Quality Assurance Standards for Forensic DNA Testing Laboratories and Convicted Offender DNA Databasing Laboratories, developed by the DAB, serve as a model for the ISP Forensic Biology QA Program. These standards delineate specific responsibilities and authority for the DNA Technical Manager and DNA CODIS Manager (see standard 4.1 of the FBI quality audit document). A copy of the document may be found in the ISP Forensic Biology Training Manual. Additionally, the ISP Forensic Services Quality/Procedure Manual designates specific authority for the DNA Technical Manager and DNA CODIS Manager.



Note: Changes (personnel) to this page do not require new revision numbers.

3.0 PERSONNEL QUALIFICATIONS AND TRAINING

3.1 Job Descriptions

General personnel qualifications and responsibilities, as well as personnel record retention policies, are described in the ISP Forensic Services Quality/Procedure Manual. Complete job descriptions are available through the Idaho Division of Human Resources web site: (http://dhr.idaho.gov/dhrapp/stateJobs/JobDescriptions.aspx).

3.2 Training

Refer to ISP Forensic Biology Training Manual and the ISP Forensic Services Quality/Procedure Manual for specific training requirements and retention of training and continuing education records.

3.3 Continuing Education

Forensic Biology personnel must stay abreast of developments relevant to forensic DNA analyses through the attendance (and participation) at DNA related presentations, seminars, courses and/or professional meetings, for a minimum of 8 hours per calendar year. The training will also be supplemented through the routine reading of current scientific literature. The DNA technical Manager, or designee, will distribute a DNA-related article to each member of the biology section on a monthly basis. Each staff member will read the article and date/initial the attached sign-off sheet to indicate the completion of the reading. Additionally, the CODIS manager must stay abreast of developments relevant to CODIS/NDIS database management, computer and data security and computer networks through the attendance (personal or that of the Alternate CODIS Manager) at the bi-annual CODIS State Administrators' meetings and annual CODIS conference.

3.4 Qualifications

Education, training and experience for Forensic Biology personnel is formally established in the following minimum requirement specifications (Minimum requirements for individual positions may be reviewed at the time of job announcement and may exceed those delineated below). The minimum degree and education requirements are verified by review of transcripts as well as course descriptions, as necessary, during the application process. The DNA Technical Manager approves the degree and coursework prior to a job offer being extended to any potential hire. Periodic review of continuing education and overall performance is

accomplished during the annual employee evaluation. Opportunities are provided by an FS training budget.

3.4.1 Forensic Biology/DNA Supervisor/Technical Lead

It is assumed for the purposes of this document (and is currently the case), that in a laboratory system of the size of Idaho's, these functions will be served by a single individual.

3.4.1.1 Education

Must have at minimum, a Master of Science degree in a biological science. Successful completion of a minimum of 12 credit hours, including a combination of graduate and undergraduate coursework in genetics, biochemistry, molecular biology and statistics (or population genetics).

3.4.1.2 Training

Training and experience in molecular biology and DNA-based analyses from academic, governmental, private forensic and/or research laboratory(ies). Must also complete the FBI sponsored DNA auditor training within 1 year of appointment, if not already completed (dependant on FBI scheduling).

3.4.1.3 Experience

Must have a minimum of three years forensic human DNA laboratory experience as an analyst.

3.4.2 CODIS Administrator

This function may or may not be served by the Forensic Biology/DNA Supervisor. It is assumed for the purposes of this document (and is currently the case) that in a laboratory system of the size of Idaho's, the functions of casework and database CODIS Administrators will be served by a single individual. An Alternate CODIS Administrator will also be appointed and must meet the same qualifications as the CODIS Manager. The CODIS Administrator is responsible for administering the laboratory's CODIS network, scheduling and documenting the computer training for analysts, as well as assuring the security and quality of data and match dispositions all in accordance with state and/or federal law and NDIS operational procedures.

3.4.2.1 Education

Must have at minimum, a Bachelor of Science degree in a biological science and successfully completed college coursework in genetics, biochemistry, and molecular biology. Must also have completed coursework and/or training in statistics (or population genetics).

3.4.2.2 Training

A combination of training and experience in the use of computers, and database systems in a laboratory/scientific setting. Must also complete the FBI's CODIS software training and the DNA auditor training within six months of appointment if not already completed (dependant on FBI scheduling).

3.4.2.3 Experience

Must possess a working knowledge of computers, computer networks, computer database management and have an understanding of DNA profile interpretation for database and casework functions, to include mixture interpretation. Must be or have been a qualified DNA analyst.

3.4.3 DNA Analyst

The following delineate requirements for a DNA casework or database analyst whose responsibilities include performing genetic analyses on the capillary electrophoresis instruments and data interpretation. DNA extraction, quantification, and amplification set-up may be performed by appropriately trained laboratory technicians and/or those performing the biological screening of evidence following task-specific training and successful completion of a qualifying examination.

3.4.3.1 Education

Must have at minimum, a Bachelor of Science degree in a biological science and successfully completed college coursework in genetics, biochemistry, and molecular biology. Must also have completed coursework and/or training in statistics (or population genetics).

3.4.3.2 Training

Training in DNA analyses through academic, governmental, private forensic and/or research laboratory(ies). If received elsewhere, documented training must meet or exceed that outlined in the ISP Forensic Biology training manual. Must successfully complete a qualifying examination prior to performing analyses on database or forensic casework samples.

3.4.3.3 Experience

Must have a minimum of six months forensic human DNA laboratory experience.

3.4.4 Forensic Biologist

The following delineate requirements for those individuals responsible for the screening of evidence for the presence of biological substances and reporting and giving testimony regarding their findings.

3.4.4.1 Education

Must have a Bachelor of Science in a biological science.

3.4.4.2 Training

Training specific to this job function in a governmental and/or private forensic laboratory. If received elsewhere, documented training must meet or exceed that outlined in the ISP Forensic Biology training manual. Must successfully complete a qualifying examination prior to performing forensic casework.

3.4.4.3 Experience

Prior to participating in independent forensic casework, must have a minimum of six months forensic laboratory experience in the area of biological screening and/or DNA analysis.

3.4.5 Biology Laboratory Technician

3.4.5.1 Education

Minimum of two years of college to include scientific coursework (lecture and lab); Bachelor

of Science degree in a biological science is preferred.

3.4.5.2 Training

Must receive on the job training specific to assigned duties and successfully complete a qualifying examination before participating in forensic DNA typing or forensic casework responsibilities.

3.4.5.3 Experience

Prior to participating in any forensic DNA typing responsibilities or forensic case processing activities, technician must have a minimum of six months forensic laboratory experience in the area of Biology/DNA; one year is preferred.

4.0 FACILITIES

4.1 Laboratory Security

Security of the Forensic Services Laboratory is covered in the ISP Forensic Services Quality/Procedure Manual.

4.1.1 Forensic Biology Security

When not under the direct control of Forensic Biology personnel, evidence and in-progress work product will be secured either by closing and locking the Forensic Biology door or by its return to secure storage (one of the locked evidence refrigerators/freezers/file cabinets or the analyst's personal evidence cabinet). Only Forensic Biology Personnel will have access to the locked storage and laboratory areas. Persons outside the Forensic Biology unit will not be allowed access to the Forensic Biology laboratories. Exceptions will be made in case of emergencies, for maintenance, safety, and/or equipment service needs, and for required annual quality and DNA audits. At these times, access will be limited to only required individuals, the individual(s) will be accompanied by biology program personnel, and all evidence will be placed in secured storage for the duration of the individual(s) being present in the laboratory.

4.1.2 CODIS Security

The CODIS workstation is located in the locked CODIS office and the CODIS Server is located in the secured server room in the CJIS Section. The following security measures have been implemented:

4.1.2.1 Only Forensic Biology personnel will have access to the CODIS office. When a biology staff member is not present, the office will be secured by closing and locking the door.

4.1.2.2 Only the CODIS State Administrator, designated Forensic Biology staff and CJIS personnel will have access to the CODIS Server.

4.1.2.3 A differential backup of the CODIS server will be performed each weekday. A full backup will be performed once weekly with the backup tape being stored off-site. At any given time, one month of data will be stored offsite.

4.1.2.4 Only Forensic Biology Personnel that have gone through the NDIS application and approval process will have user-names and passwords for CODIS.

4.1.2.5 CODIS users must log in each time they use CODIS and log out prior to leaving the CODIS Workstation.

4.1.2.6 DNA Tracker, the convicted offender sample-tracking database, resides on the ISP intranet and is accessible only to personnel designated by the Biology/DNA Supervisor.

4.1.2.7 Personal and identifying information on convicted offenders (hard and electronic/DNA Tracker copies) are stored separately from the DNA profile (CODIS) obtained. The DNA profiles are directly associated only with a unique Idaho Convicted Offender ID number, assigned by DNA Tracker upon sample entry.

4.1.2.8 CODIS samples and corresponding information are released only in accordance with 19-5514 of the Idaho DNA Database Act of 1996, the Privacy Act Notice in Appendix E of NDIS procedures, and the FBI/CODIS Memorandum of Understanding.

4.2 Forensic Biology Laboratory Set-up

The Forensic Biology and Database Laboratories are designed to minimize contamination potential during the processing and analysis of forensic and convicted offender samples. Separate areas for evidence examination, DNA extraction, PCR Amplification Set-up and Amplified DNA processing and storage are delineated. Some steps of the pre-amplification processes may be conducted in the same area of the main laboratory; however, these steps are separated by time.

4.3 Laboratory Cleaning and Decontamination

In order to minimize the potential for sample contamination, careful cleaning of laboratory work areas and equipment must be conducted on a routine basis. The efficacy of the procedures used is monitored through the use of controls within the analysis process (see the interpretation guidelines section in BI-210 and BI-318). It is also important that each analyst use proper 'clean technique' at all times when in the laboratory, which includes but is not limited to, using only disposable barrier pipette tips and autoclaved microcentrifuge tubes, using a tube de-capping tool, and wearing gloves, a labcoat, and masks as appropriate.

4.3.1 All working **benchtop** surfaces will be cleaned with 10% bleach or Dispatch solution before and after use and as part of the monthly QC procedure. Clean white paper and/or a KayDry will be placed on the workbench prior to use and changed as appropriate and necessary.

4.3.2 All **small tools/instruments** (i.e. forceps, scissors, etc.) will be cleaned/rinsed with ethanol or germicidal instrument cleaner prior to use and between samples. Kimwipes, used to dry the instrument after cleaning/rinsing, will be single use only.

4.3.3 **Pipettes** are to be cleaned thoroughly with Dispatch solution as part of the monthly QC procedure and anytime the barrel comes in contact with DNA or any biological fluid.

4.3.4 All **centrifuges** are to be wiped down (interior and exterior) with Dispatch solution as part of the monthly QC procedure and in the event of a spill.

4.3.5 The **Biomek 3000** work surface trays and holders are to be removed and cleaned with 10% bleach or Dispatch solution as part of the monthly QC procedure or in the event of a spill. Additionally, each of tools are to be wiped down with ethanol, being careful not touch the electronic end.

4.3.6 The exterior surfaces of the **BSD600-Duet Puncher** are to be wiped down with a damp cloth, as part of the monthly QC procedure. In addition, the chute and punch mechanism are to be cleaned by removing and separating the inner and outer chutes. The inner chute is to be cleaned with ethanol, followed by compressed air blown through both chutes, the hole in the underside of the manifold, and between the punch guide and die. Do not use ethanol on the outer chute or around any electrical components.

4.3.7 The **thermal cyclers**, to include the heating block and exterior surfaces, are to be wiped down with ethanol or Dispatch solution as part of the monthly QC procedure. Individual wells should be cleaned as needed.

4.3.8 All work surfaces in the **amplification/post-amp rooms** are to be cleaned with 10% bleach or Dispatch solution before and after analysis and as part of the monthly QC procedure. Clean white paper and/or a KayDry is to be placed on the benchtop prior to use. Additionally, as part of the

monthly QC procedure, the following are to be conducted: the exterior surfaces of the genetic analyzers and real-time instruments wiped down with ethanol or Dispatch solution, top of the refrigerator/freezers and surface underneath each genetic analyzer wiped down/dusted, and floor mopped.

5.0 EVIDENCE CONTROL

Evidence, Individual Characteristic Database (Convicted Offender) samples, in progress work product, and applicable Standard Reference Materials, that are collected, received, handled, sampled, analyzed and/or stored by ISP Forensic Services is done so in a manner to preserve its identity, integrity, condition and security.

5.1 Laboratory Evidence Control

Procedures detailing evidence handling are contained in the ISP Forensic Services Quality/Procedure Manual. Standard Reference Materials will be handled, stored, and used according to the guidelines outlined on the corresponding certificate of analysis. Bloodstains certified against a NIST SRM will be used as a known standard, stored frozen, and handled as a potential biohazard. Portions of individual evidence items that are carried through the analysis process (i.e. substrate cuttings, extracts, amplified product and/or portions thereof) are considered work product while in the process of analysis and do not require sealing. Work product will be identified by labeling the individual sample tube with a unique identifier, or documenting the locations of individual samples within a plate of samples.

5.2 Forensic Biology Evidence Control/Sample Retention

5.2.1 DNA Packet

It has become increasingly important to retain evidence for possible future analyses and to secure samples for non-probative casework analyses that are necessary for the validation of any new technology. Therefore, a DNA packet is created for cases submitted for analysis to Forensic Biology, in which reference sample(s) are present, and/or positive Biological screening results are obtained (See BI-102). Any remaining DNA extracts, upon completion of analysis, will be placed into a sealed container (such as a plastic zip bag) and stored in the DNA packet.

5.2.2 Limited Sample

In every case, care should be taken to save ~1/2 of a sample for independent testing. If testing would consume all or nearly all of a sample **and** there is an identified suspect charged in the case, the accused must receive appropriate notification. Written and/or verbal notification will be given to the prosecuting attorney informing him/her of possible consumption and requesting defense counsel be notified of the situation. Before testing will commence, an allowance

will be made for testing by another accredited laboratory agreed upon by both parties. Additionally, a letter from the prosecuting attorney must be received by the laboratory indicating whether or not the sample may be consumed.

5.2.3 Amplified Product

Amplified DNA product will not be retained after 1) the report has been issued in the case or 2) review of the offender sample data has been completed and certified for CODIS entry. In cases where both the evidence and associated DNA extract have been consumed, the amplified product will be retained in a sealed container within the product room freezer.

6.0 VALIDATION

Procedures for the validation and/or performance verification of methods used in ISP Forensic Services are outlined in the ISP Forensic Services Quality/Procedure Manual. Validation/performance verification data, results and summaries for those methods employed in Forensic Biology will be maintained in that section.

7.0 CHEMICALS/REAGENTS

General laboratory policies and procedures regarding the purchase of chemicals and preparation of reagents are covered in the ISP Forensic Services Quality/Procedure Manual.

7.1 COMMERCIALLY PURCHASED CHEMICALS

7.1.1 Biology Personnel should consult the section's electronic Chemical Inventory Log (Form 400-QC) prior to ordering. Chemical grade requirements should be checked and ordered as appropriate. The date ordered should be reflected in the log to avoid duplicate orders. An entry for chemicals not currently on the inventory will be made at this time to reflect the chemical, source, and order date. This inventory will be audited annually, at a minimum, and a printout placed in the Forensic Biology Reagent Binder.

Note: An order form/document must be filled out and approved by the section supervisor (indicated by date and initials) prior to placing the order. Reference the forensic services approved chemical list prior to ordering new chemicals.

7.1.2 Upon receipt of a chemical or reagent, the Chemical Inventory Log will be updated to reflect the new lot number, received date, quantity received, and quantity in stock. The order date will be removed at this time. The chemical(s) will be marked with the date received and the individual's initials. If it is an outer container that the chemical/kit remains in until use, the inner container will be labeled with this information when removed for use. The following commercially purchased reagents do not have manufacturer expiration dates: Phenol:Chloroform (PCIAA), HiDi Formamide, and 10X Genetic Analyzer buffer. These will additionally be labeled with a laboratory assigned expiration date of 2 years from the date of receipt. Packing slips should be checked to ensure appropriate accounting, including proper reagent grade, where applicable (this will be indicated by dating and initialing the packing slip and making notations as necessary). The packing slip and corresponding order document will be retained in the biology section. If an MSDS sheet came with the chemical, the MSDS binder should be checked for the presence of an MSDS for that chemical. If one exists, no additional copy is kept; however, if a newer version is received, the old one should be replaced. If one does not

already exist, place the one received in the binder. For chemicals without a hard copy MSDS, the manufacturer or one of the following websites may be consulted for information as needed:

http://www.hazard.com/msds
http://www.msds.com
http://www.ilpi.com/msds/

Note: Critical Reagents listed in 7.3 will be tracked on the individual QC forms, rather than the chemical inventory log.

7.1.3 Expired chemicals will be disposed of in an appropriate manner.

7.2 REAGENTS PREPARED IN-HOUSE

7.2.1 All biology reagents will be made with great care, following all quality and safety procedures. A mask will be worn by analysts during reagent preparation to help avoid the potential for contamination. See **7.4** and **7.5** below for individual reagent recipes.

7.2.2 Each reagent has a corresponding form to document the making of the reagent and components used. This form must be filled out. A reagent label must be made that has the reagent name, the lab lot number (which consists of the first few letters of the reagent name followed by the date prepared, in the form 'MMDDYY'), and the preparer's initials. The NFPA designation will be completed on all labels. Refillable squirt-bottles of water or ethanol will be labeled but need not bear dates or initials.

7.2.3 An effort should be made to use in-house reagents within one year of preparation; however, they do not expire and may continue to be used beyond the one year timeframe.

7.3 CRITICAL REAGENTS

CRITICAL REAGENTS are those reagents that, if improperly functioning, could result in significant loss or destruction of DNA and are not amenable (or it's not practical) to testing immediately before (e.g., use on forensic samples) each use. The reagents listed below have been identified as critical in Forensic Biology/DNA. These reagents must undergo a **QC ASSAY BEFORE** use on forensic casework and/or Convicted Offender

samples. Reagents received at a later date but having the same lot number as those previously tested and determined acceptable need not have a QC check performed. Critical Reagents (in addition to other DNA-related reagents with manufacturer expiration dates) may be used beyond the listed expiration date for training purposes without any further testing, so long as expected results are obtained for all associated controls. The reagent must be labeled 'for training only' if it is to be retained once the expiration date has been reached.

ABACARD® HEMATRACE® TEST KIT (Form 410-QC)

OneStep ABACARD® p30 TEST KIT (Form 412-QC)

Quantifiler® Human DNA Quantification Kit (Form 419A-QC)

Plexor® HY System Kit (Form 419B-QC)

STR Kit (Taq Polymerase checked with kits; Form 420-QC)

7.4 BIOLOGICAL SCREENING REAGENTS

Phenolphthalein (Kastle-Meyer) Reagent
(NFPA: health 3, flammability 1, reactivity 2)

May be a commercial purchase.

Phenolphthalein	2.0g
KOH	20.0g
Zinc (granular)	20.0g

Phenolphthalein, KOH, and 100mℓ of dH_2O are refluxed, in a fume hood, with Zinc until solution is colorless (producing phenolphthalin in ~4 hours). Store stock solution refrigerated in dark bottle to which ~5g mossy zinc has been added to keep the solution in its reduced form. Remove for working solution as needed.

Working solution: Mix 2mℓ stock solution with 8mℓ Ethanol

Caution: Zinc is flammable. The unreacted portions and used filter paper are to be disposed of properly.

Hydrogen Peroxide 3% (v/v)
(NFPA: health 0, flammability 0, reactivity 1)

Generally a commercial purchase, however, may be made from a 30% Solution (which is a commercial purchase) as follows:

Hydrogen Peroxide (30%) 10mℓ/90mℓ nanopure dH_2O

Mix the H_2O_2 with 90mℓ of nanopure dH_2O and store at ~4˚C.

Ortho-Tolidine Reagent
(NFPA: health 3, flammability 1, reactivity 2)

O-Tolidine	0.6g
Glacial Acetic Acid	100mℓ
Ethanol	100mℓ

Dissolve O-tolidine in Acetic Acid/Ethanol mixture consistent with ratios above. O-tolidine is light sensitive and should be stored in dark reagent bottle and kept refrigerated when not in use.

Ammonium Hydroxide (~3%)
(NFPA: health 3, flammability 1, reactivity 2)

Ammonium Hydroxide (Concentrated ~30%) 10mℓ/100mℓ

Add the NH_4OH to 90mℓ of nanopure dH_2O, mix well and store at RT.

Ouchterlony Destain
(NFPA: health 3, flammability 3, reactivity 2)

Methanol	45mℓ
Distilled water	45mℓ
Glacial Acetic Acid	10mℓ

Mix well and store refrigerated.

Ouchterlony Stain
(NFPA: health 3, flammability 3, reactivity 2)

Ouchterlony Destain	50mℓ
Coomassie Blue (Brilliant Blue R-250)	0.1g

Mix well (overnight), filter, and store at RT.

10X Brentamine (Sodium Acetate) Buffer
(NFPA: health 2, flammability 2, reactivity 2)

Sodium Acetate (Anhydrous)	1.2g
Acetic Acid(to adjust to pH 5)	≈400µℓ

Dissolve Sodium Acetate in 10mℓ of nanopure dH_2O. Add Acetic Acid to pH 5. Store refrigerated.

Brentamine Solution A
(NFPA: health 1, flammability 0, reactivity 0)

O-Dianisidine Tetrazotized (Fast Blue B Salt)	50 mg
10X buffer pH 5	5 mℓ

Dissolve Fast Blue B Salt in 5 mℓ of 10X Brentamine Buffer. Store refrigerated in a dark container.

Brentamine Solution B
(NFPA: health 2, flammability 0, reactivity 0)

α-Naphthyl Phosphate (Disodium Salt)	50 mg

Dissolve in 5 mℓ of nanopure dH_2O. Store Refrigerated.

Saline (0.85% NaCl)
(NFPA: health 1, flammability 0, reactivity 0)

NaCℓ	4.25g/500mℓ

Dissolve the NaCℓ in 500 mℓ nanopure water. Sterilize by autoclaving. Store refrigerated.

1X Phosphate Buffered Saline (PBS)
(NFPA: health 1, flammability 0, reactivity 1)

PBS	1 commercial pre-made packet

Dissolve one packet of powdered PBS in 1ℓ of nanopure dH_2O. Check that pH≅7.4, autoclave and store at RT.

If pre-made packets are not available, PBS may be prepared by dissolving 0.2g KCl, 8.0g NaCl, 0.2g KH_2PO_4, and 2.2g $Na_2HPO_4 \cdot 7H_2O$ (or 1.1g Na_2HPO_4 anhydrous) in 800mℓ nanopure dH_2O. Adjust pH to 7.4 if necessary. Q.S. to 1ℓ with nanopure dH_2O, autoclave and store at RT.

X-mas Tree Stain Solution A (Kernechtrot Solution)
(NFPA: health 1, flammability 0, reactivity 0)

May be a commercial purchase.

Aluminum Sulfate	5g
Nuclear Fast Red	0.1g

For 100mℓ, Dissolve the Aluminum Sulfate in 100mℓ **HOT** nanopure dH_2O. Immediately add the Nuclear Fast Red, mix, cool and filter (paper or ≥45µm). May be stored at RT.

X-mas Tree Stain Solution B (Picroindigocarmine Solution)
(NFPA: health 2, flammability 2, reactivity 2)

May be a commercial purchase.

Saturated Picric Acid Solution	100mℓ
Indigo Carmine	0.33g

For 100mℓ, dissolve the Indigo Carmine in 100mℓ of the Picric Acid. Mix and filter (paper or ≥45µm). May be stored at RT.

Amylase Diffusion/Phosphate Buffer (pH 6.9)
(NFPA: health 1, flammability 0, reactivity 1)

NaH_2PO_4, anhydrous	2.7g
Na_2HPO_4, anhydrous	3.9g
NaCℓ	0.2g

Mix the above with 500mℓ dH_2O, adjust pH to 6.9, and store at RT.

Amylase Iodine Reagent
(NFPA: health 3, flammability 0, reactivity 2)

Potassium Iodide (KI)	1.65g
Iodine (I_2)	2.54g

Dissolve the above in 30mℓ nanopure dH_2O heated to ~65°C. Mix well, filter and store at 4°C in an amber bottle. Dilute 1:100 for Amylase Diffusion Test.

Mercuric Chloride 10% (w/v)
(NFPA: health 4, flammability 0, reactivity 1)

Mercuric Chloride	10g/100mℓ 95% EtOH

Dissolve the Mercuric Chloride in 100mℓ of 95% Ethanol, mix well and store at RT.

Zinc Chloride 10% (w/v)
(NFPA: health 2, flammability 0, reactivity 2)

Zinc Chloride	10g/100mℓ 95% EtOH

Dissolve the Zinc Chloride in 100mℓ of 95% Ethanol, mix well and store at RT.

7.5 DNA REAGENTS

1M Tris-HCl Buffer pH 7.5
(NFPA: health 2, flammability 1, reactivity 1)

Tris Base(tris[Hydroxymethyl]amino methane)	121.1 g

Dissolve Tris in ~800 mℓ nanopure dH_2O. Adjust to pH7.5 at RT by adding concentrated HCℓ (approximately 65mℓ). Q.S. to 1ℓ with nanopure dH_2O, autoclave and store at RT.

1M Tris-HCl Buffer pH 8
(NFPA: health 2, flammability 1, reactivity 1)

Tris Base(tris[Hydroxymethyl]amino methane)	121.1 g

Dissolve Tris in ~800 mℓ nanopure dH_2O. Adjust to pH8 at RT by adding concentrated HCℓ (approximately 45mℓ). Q.S. to 1ℓ with nanopure dH_2O, autoclave and store at RT.

0.5M Ethylenediamine Tetraacetic Acid (EDTA)
(NFPA: health 1, flammability 1, reactivity 0)

$Na_2EDTA \cdot 2H_2O$ 186.1g/ℓ

Slowly add EDTA to 800mℓ nanopure H_2O while stirring vigorously. Add ~20g of NaOH pellets to bring the pH to near 8.0. When fully dissolved adjust pH to 8.0 and bring final volume to 1ℓ. Autoclave and store at RT.

Note: EDTA will not go into solution without the pH adjustment.

Stain Extraction Buffer pH8 (10mM EDTA/10mM Tris-HCl/50mM NaCl/2% SDS)
(NFPA: health 2, flammability 1, reactivity 1)

1M Tris-HCℓ, pH7.5	5mℓ
0.5M EDTA	10mℓ
5.0M NaCℓ	5mℓ
10% SDS	100mℓ

Mix the Tris-HCℓ, EDTA, NaCℓ and SDS with ~380mℓ nanopure dH_2O. Store at RT.

Note: Reagent contains SDS, do not autoclave.

Proteinase K (20mg/ml)
(NFPA: health 1, flammability 1, reactivity 0)

May be a commercial purchase of 20mg/ml solution.

Proteinase K 0.2g

Dissolve the ProK in 10mℓ sterile nanopure dH_2O.

Dispense ~500µℓ (commercial purchase or in-house prep.) each into sterile microfuge tubes and store at ≅20°C.

1M Sodium Acetate pH 5.2
(NFPA: health 3, flammability 2, reactivity 0)

$CH_3COONa \cdot 3H_2O$ 13.6g

Dissolve the $CH_3COONa \cdot 3H_2O$ in 80mℓ nanopure dH_2O. Adjust to pH5.2 by adding glacial acetic acid (approximately 2 mℓ). Q.S. to 100mℓ with nanopure dH_2O, autoclave and store at RT.

DTT Solution
(NFPA: health 2, flammability 1, reactivity 0)

Dithiothreitol (DTT) 0.77g

Dissolve the DTT in 5mℓ nanopure dH_2O. Add 50µℓ 1M Sodium Acetate, pH5.2. Dispense ~500µℓ each into sterile microcentrifuge tubes and store at ≅20°C.

Note: Do not autoclave.

PCR-TE (TE^{-4}) Buffer (10mM Tris-HCl/0.1mM EDTA)
(NFPA: health 2, flammability 1, reactivity 0)

1M Tris-HCl, pH8 10mℓ
0.5M EDTA, pH8 0.2mℓ

Mix Tris-HCl and EDTA with 990mℓ nanopure dH_2O. Autoclave and store at RT.

5N Sodium Hydroxide
(NFPA: health 3, flammability 0, reactivity 2)

NaOH 50g

Slowly dissolve the Sodium Hydroxide in 250mℓ sterile nanopure dH_2O. Allow to cool and store at RT.

Caution: NaOH is highly caustic. This reaction generates heat.

5M Sodium Chloride
(NFPA: health 1, flammability 0, reactivity 0)

May be a commercial purchase of 5M solution.

NaCℓ 146.1g/500mℓ

Dissolve the NaCℓ in 500 mℓ nanopure water. Sterilize by autoclaving.

Bovine Serum Albumin 4%
(NFPA: health 0, flammability 1, reactivity 0)

BSA	0.4 g
PCR-TE	10 mℓ

Dissolve the BSA in PCR-TE. Filter-sterilize and dispense ~500µℓ each into 1.5mℓ microfuge tubes. Store at ~-20°C.

8.0 EQUIPMENT CALIBRATION AND MAINTENANCE

General laboratory procedures for the calibration and maintenance of equipment are covered in the ISP Forensic Services Quality/Procedure Manual.

8.1 BIOLOGY EQUIPMENT/INSTRUMENTATION

8.1.1 Analytical equipment significant to the results of examination and requiring routine calibration and/or performance verification will be listed on the BIOLOGY CRITICAL EQUIPMENT INVENTORY Spreadsheet (Form 401-QC). Information on the spreadsheet includes (as known or appropriate): equipment identity and its software, manufacturer's name, model, property number, serial number and/or unique identifier, and location. The inventory spreadsheet will be maintained in the instrument QC binder or section QC binder as appropriate.

8.1.2 OPERATING MANUALS for most equipment/instrumentation will be maintained in the product information file (Manuals for the ABI PRISM™ 3130/3130xl Genetic Analyzers, ABI 7500 Real-Time PCR System, Thermal Cyclers, and Driftcon FFC will be maintained in the Amp/PostAmp Room in close proximity to the instruments). Exceptions may be made for manuals referred to for instructions. In these cases, the manual will be maintained in close proximity to the instrument. The Biomek 3000 manual is built into the Biomek software.

8.1.3 MAINTENANCE/REPAIR/CALIBRATION LOGS will be maintained as follows:

The records for the ABI PRISM™ 3130/3130xl Genetic Analyzers, ABI 7500 Real-Time PCR System, and Thermal Cyclers will be maintained in the instrument QC binder.

Any equipment/instrumentation function (not documented on weekly, monthly, quarterly, or annual QC Check forms) will be recorded on the Equipment Maintenance/Repair form (Form 402-QC). Equipment Failure will also be reported on this form. This form and the QC check forms will be maintained in the section QC Binder, except as listed above.

8.1.4 EQUIPMENT FAILURE will result in that equipment being 'taken out of service'; an 'out of service' sign will be placed on the equipment and it will not be returned to service until it has passed appropriate performance testing. Actions are reported on Form 402-QC.

8.1.5 The SCHEDULE of QC/Performance Checks for both critical and non-critical equipment is as follows:

WEEKLY (Form 404A/B/C-QC)
(once per week with an interval between dates not less than 3 days and not exceeding 10 days)

- Nanopure System Check
- Refrigerator/Freezer Temperature Check
- Heating Block(s) Temperature Check
- Oven Temperature Check
- Water Bath Temperature Check

MONTHLY (Form 406A/B/C-QC)
(once per calendar month with an interval between dates not less than 15 days and not exceeding 45 days)

- Pipettes Cleaned
- Centrifuges Cleaned
- Biomek 3000 Cleaned
- BSD600 Cleaned
- Lab Cleaned
- Eye Wash Station Check
- Autoclave Clean and Check Sterilization
- ABI 7500 Background Assay/Contamination Test, and Function Test/Bulb Check
- BioRobot EZ1 grease D-rings
- 3130/3130xl Water Wash
- 3130/3130xl Water Trap Flush
- 3130/3130xl(C and E drives) and 7500 computer defragmentation

QUARTERLY
(once per quarter with an interval between dates not less than 30 days and not exceeding 120 days) Note: * denotes critical equipment

- Thermal Cycler* Temperature Verification
- ABI 7500* Temperature Verification

- Biomek 3000 Robotic System* Framing/Calibration Check (Form 408-QC)
- Chemical Shower Check (Form 408-QC)

ANNUALLY (Form 402-QC)
(once per calendar year with an interval between dates not less than 6 months and not exceeding 18 months) Note: * denotes critical equipment

- Mechanical Pipette* Performance Verification Check (outside vendor)
- NIST Traceable Thermometers* (outside vendor)
- Driftcon FFC Temperature Verification System* (outside vendor)
- Biological and Chemical Hoods Test (outside vendor)
- Digital Temperature Recording Devices Calibration Check (outside vendor)
- ABI PRISM™ 3130/3130xl* Genetic Analyzer Preventative Maintenance (outside vendor)
- ABI 7500* Real-Time PCR System Preventative Maintenance(outside vendor)
- ABI 7500* Pure Dye Calibration, Optical Calibration, and Regions of Interest (ROI's) verification (see 7500 Maintenance Guide for procedures/may be part of PM by request)
- Qiagen BioRobot EZ1* Preventative Maintenance (outside vendor)
- Biomek 3000* preventative Maintenance (outside vendor)
- Microscope Cleaning/Preventative Maintenance (outside vendor)
- Centrifuge Calibration Check (outside vendor)
- Balance* Calibration Check (outside vendor)

In addition to the above schedule, personnel should check appropriate parameter function on all instrumentation with each use (including calibration of the pH meter at the time of use; documented on Form 403-QC), and run a spatial and spectral calibration for the ABI PRISM™ 3130/3130xl Genetic Analyzers as needed or following CCD camera and/or laser replacement/adjustment.

Following the annual preventative maintenance, a sensitivity panel (previously characterized DNA) should be run on the 3130/3130xl and included in the QC binder as a verification of performance. A color plate and framing/calibration check are to be run on the Biomek 3000, documented on Form 428-QC, and included in the Database QC binder as a performance check following the annual preventative maintenance. The Driftcon FFC will be run on each thermal cycler (including 7500's) following repair and prior to being placed back in to service as a verification of performance. If no repairs were necessary, the pure dye calibration and ROI's will serve as the performance verification for the 7500's following the annual

preventative maintenance. Documentation will be maintained in the section QC binder.

Any problems noted with laboratory equipment, during normal usage or as part of a QC check should be brought to the attention of the necessary supervisory personnel and documented on Form 402-QC and/or the respective QC form.

A certified NIST standard will also be run annually or if substantial procedural changes have been made. The QC run will be documented on Form 426-QC and filed in the section QC binder.

9.0 PROFICIENCY TESTING

General laboratory guidelines and practices for proficiency testing and retention are outlined in the ISP Forensic Services Quality/Procedure Manual. Additional Biology/DNA requirements are delineated below.

9.1 External DNA Proficiency Test Requirement. DNA analysts will participate in external proficiency tests, twice in every calendar year, in accordance with The FBI Quality Assurance Standards and the results reported to NDIS as necessary.

9.2 Inconclusive/Uninterpretable Proficiency Test Results. Typically, sample size/quantity in PCR DNA Proficiency Tests is sufficient for multiple analyses to be performed. Therefore, results of DNA proficiency tests are not likely to be either inconclusive, or uninterpretable (e.g., not meeting minimal rfu and/or statistical threshold for inclusion/exclusion). However, in the event data obtained in a proficiency test does not meet the standard guidelines for interpretation/conclusion, it will first be determined, by re-testing and communication with the vendor, that this is not an issue with a given sample(s). Once that determination has been made, the analyst obtaining the inconclusive data will be removed from casework/database sample analysis until satisfactory completion of a competency test and review of the analyst's casework/database analysis performed since the last successful proficiency test.

10.0 CORRECTIVE ACTION

Laboratory corrective-action and retention procedures are detailed in the ISP Forensic Services Quality/Procedure Manual.

11.0 FILE DOCUMENTATION AND REPORTS

Meticulous documentation is an important aspect of forensic work. In casework, the scientist's knowledge of case circumstance (and therefore their ability to discern potential significance) may be limited. It is also common to be called upon to testify months, or even years, after processing evidence for a given case. Careful observation and detailed note-taking will not only refresh the scientist's memory and provide support for the conclusion in the laboratory report, but might also provide additional information not thought to have been important at the time of evidence processing. General laboratory policies regarding case record and retention are described in the ISP Forensic Services Quality/Procedure Manual. The note packet is considered complete when the analyst signs the report and submits the packet to be reviewed. Electronic documentation (eg. electropherograms and tables of results) are considered stored at this time. Any changes to the electronic documentation required after this point (typically on or after the review date documented in the note packet) will be made either by hand on the hard copy (initialed and dated by the analyst), or by changing the electronic version, reprinting and making a notation on the new hard copy as to the changes made. The new printed copy will bear the date the changes were made/reprinted.

11.1 CASE NOTES

11.1.1 Each page of case notes should have the following: Laboratory Case Number, Date, Scientist's Initials and page number (in a form indicating page/total pages).

11.1.2 Case notes are associated with a particular report. Case notes for additional submissions (i.e., for supplemental reports) will be reflected in the page numbering as well (e.g. s1, supp. 1, etc.).

11.1.3 All evidence submitted for biological screening should be transferred to the scientist (i.e., documented on the chain of custody) and bear the scientist's initials. This is the case regardless of whether or not they analyze the item of evidence (exception may be made in cases where communication with investigator/attorney identified select items of those submitted). A description of the evidence (e.g., packaging and what it is said to contain) should

also appear in the case notes with a notation about not being examined at the time, if that's the case. Those items should also appear in the "not examined" statement of the report.

11.1.4 The description of evidence packaging should include the type and condition of seal(s). Differences in the description on a package versus ETS entry and/or accompanying submission form (or what the evidence is once opened) should be noted.

11.1.5 Whenever feasible, every attempt should be made to gain entry into the evidence without breaking the original seals. Any seal altered or created by a scientist will bear their initials and date across the seal.

11.1.6 Evidence descriptions should be "unique" inasmuch as possible (i.e., one pair blue jeans is **NOT** adequate). They should include, as appropriate and necessary for identification, colors, sizes (measurements where appropriate- e.g., knife and blade), manufacturer, model, brand, serial numbers or other identifiers and condition (e.g., worn, clean, torn, mud-caked, blood-soaked, etc.).

11.1.7 Photography, digital or otherwise, is often useful in documenting the appearance of evidence items. However, it is not meant to completely replace drawing, but instead as a supplement or in cases when drawing may be too difficult to accurately depict the item. Careful drawing and description result in careful and detailed examinations and, in many instances, may be a better choice than photography. Digital photographs will be transferred to, printed as necessary for case notes, and stored within the Mideo System; refer to BI-119 for Mideo instructions.

11.1.8 Evidence numbering must be unique for the purpose of possible later CODIS entry and chain of custody tracking. Items should be numbered as follows (or other similar system):

A single item (e.g., a baseball cap; Item 57) for which:

≤ 1 area tested positive for a biological substance and the stain is removed for DNA testing ≡ Item 57A (note: if the entire item is to be retained for DNA testing ≡ Item 57)

≥2 areas tested positive for a biological substance(s) (in this instance 3 areas removed for DNA testing)≡ Item 57-1, Item 57-2 and Item 57-3, or 57-A, 57-B and 57-C.

An item with multiple sub-items (e.g., a SAECK; Item 1) ≡ Item 1A, Item 1B, Item 1C, etc., the scientist should begin with the most relevant item if possible. Multiple areas ≡ Item 1A-1, Item 1A-2 etc.

11.1.9 The Biology Screening Case Summary Form (Form 101-BI) may be used for summarizing analyses if the scientist chooses.

11.1.10 If a form is used for more than one case, a copy of the 'completed' form should be made for any additional case files. A reference regarding the location of the original document(s) will be made in the note packet. For each file, the associated case should be listed and case data highlighted. In general, biology subfolders should be organized from front to back as follows: copy of evidence submission form or ETS property form, restitution where applicable, report, chronological case notes/forms, SAECK form where applicable, CODIS entry forms where applicable, case review forms where applicable, phone/info log ('tangerine' paper may be used for ease of identification), followed by agency materials submitted with evidence. Upon completion of review the analyst should bind (e.g. staple) the documentation together, with the exception of the applicable submission forms, restitution, and report, and submit to the Forensic Evidence Specialists for report/restitution distribution.

11.2 DATABASE PACKETS

11.2.1 Each page of the database packet should have the following: Plate Identifier, Date, Scientist's Initials, and page number (in a form indicating page/total pages).

11.2.2 In general, database packets will be arranged from front to back as follows: chronological worksheets, reinjection summary and table of results (it is not necessary to print electropherograms for database packets). Review forms may be placed at the front of the packet for ease of plate

identification. Upon completion of review, the analyst should bind (e.g. staple) the documentation together and file it appropriately.

11.3 CASEWORK REPORTS

In the interest of consistency and clarity of reports between individual scientists the following format should be adhered to:

11.3.1 The report will contain the title Forensic Biology Report for biology screening reports, or Forensic DNA Report for DNA reports.

11.3.2 For clarity, when a statement(s) is about a particular Item (or multiple items listed individually), the "I" will be capitalized as in a name. When writing in general terms (i.e., the following items:) the "i" will remain lowercase.

11.3.3 The case submission information will include, at a minimum: case#, report date, case agency, agency case#, principals (victim, suspect, etc.), and offense date.

11.3.4 The body of the report will be separated from the case submission information by the following headings in the format below:

RESULTS AND INTERPRETATIONS

Statements (see below) regarding evidence exam, results and conclusions. The order of statements should be, inasmuch as possible: 1) positive statements (detection of body fluid), 2) inconclusive statements, 3) negative statements and 4) statements regarding (i.e. a list of) items not examined.

Disposition of Evidence

Statements (See below) regarding evidence retention and return.

Evidence Description

The following items were received in the laboratory via Federal Express (UPS, US Mail, etc.) on Month day, year. (or) The following items were received in the laboratory from Agency Representative (Agency) on Month day, year.

Description of items submitted for examination.

In the first report, all items should be listed (any items scientist took possession of, including reference samples). In supplemental reports, only those items relevant to the additional examinations need to be listed.

DNA reports, in which a DNA packet is checked out for analysis, will state: A tape sealed DNA packet envelope, created in the laboratory on Month day, year, and containing the following items:

Description of items contained within the DNA packet.

This report does or may contain opinions and/or interpretations, of the undersigned analyst, based on scientific data. The analyst's signature certifies that all of the above are true and accurate. *(Note: the interpretations statement does not need to be included in reports where all items submitted are being returned without analysis, or other instances when no conclusions or interpretations are made.)*

Signature

_____

Name of Scientist
Title of Scientist

11.3.5 The following results/conclusions statements are to be used in a **biology screening report**, as dictated by the analysis findings (Where appropriate, descriptions, quantity, and/or locations of individual stains may be included in the corresponding statements. Portions of individual statements may be combined as needed.):

Semen Results/Conclusions Statements:

Chemical and microscopic analyses for the detection of semen were conducted on (items). Semen was confirmed by the presence of spermatozoa on (items). (or) Semen was not detected on (items). (or) No identifiable spermatozoa were detected on (items).

Chemical and microscopic analyses for the detection of semen were conducted on (items). Semen was confirmed on (items) by the presence of a single spermatozoon (or limited number of spermatozoa), which is (or may be) insufficient for further testing at this time.

Chemical, microscopic, and serological analyses for the detection of semen were conducted on (items). Semen was detected on (items) by the presence of the semen specific protein, p30; however, no spermatozoa were observed, which is insufficient for further testing at this time.

Results from presumptive chemical tests for the presence of semen were negative on (items).

Blood Results/Conclusion Statements:

Results from chemical and serological tests performed on (items) indicated the presence of human (or non-human) blood.

Results from presumptive chemical tests performed on (items) indicated the presence of blood; however, serological tests to determine the species of origin were not performed (or were inconclusive).

Results from presumptive chemical tests for the presence of blood were negative on (items).

Saliva Results/Conclusions Statements:

Results from chemical tests performed on (items) indicated the presence of an elevated level of amylase, an enzymatic component of saliva.

Results from chemical tests performed on (items) indicated (or did not indicate, or were inconclusive for) the presence of amylase, an enzymatic component of saliva.

Urine Results/Conclusions Statements:

Results from presumptive chemical tests performed on (items) indicated (or did not indicate, or were inconclusive for) the presence of urine.

Feces Results/Conclusions Statements:

Results from presumptive chemical tests performed on (items) indicated (or did not indicate, or were inconclusive for) the presence of feces.

Further Testing Statements (to be included at the end of the Results of Examination Section):

If additional testing is desired, please contact the laboratory.

DNA testing can be performed (or may be attempted) upon request and submission of a known reference sample(s) from [list name(s)]. Please contact the laboratory regarding the analysis request.

11.3.6 The following results/conclusions statements are to be used in an **STR DNA Report** (**Note:** the epithelial cell fraction of intimate samples, such as vaginal/rectal swabs, etc., are not considered probative if the testing results in a single profile matching the individual from which the sample was collected. In these instances, a statement regarding the DNA source of this fraction is not required):

Deoxyribonucleic Acid (DNA) Analysis, employing the Polymerase Chain Reaction (PCR), was used to generate a Short Tandem Repeat (STR) profile from the following items: "list of items".[1]

Note: The following footnote will appear in all reports in which DNA testing was attempted.

[1]Loci Examined: D3S1358, TH01, D21S11, D18S51, Penta E, D5S818, D13S317, D7S820, D16S539, CSF1PO, Penta D, vWA, D8S1179, TPOX, and FGA.

Profile Match Statement [meeting the 'source attribution' criterion (estimated frequency in population of ≤ 1 in $1.6x10^{10}$)] for single source and identifiable major contributors of a mixture:

The DNA profile obtained from the "item description (Item #)" matches that obtained from the blood stain/sample (or reference oral swab/sample, etc.) of/from "name". Therefore, "name" is the source of the "(DNA, blood, semen, saliva etc.) " on this item[2].

Note: The following footnote will appear in any report containing the above match statement.

[2]This conclusion is based upon the following: 1) a genetic match at the gender identity locus, Amelogenin, in addition to the "number" polymorphic STR loci listed above that have an expected population frequency of at least less than 1 in "actual (most conservative of the population groups calculated) frequency estimate", 2) a statistical frequency exceeding the source attribution criterion of 1.6×10^{10} (for $N=1.6 \times 10^{7}$, $\alpha=0.01$; *Forensic Science Communications 2(3)July 2000)*, and 3) that "name" does not have a genetically identical twin.

Profile match Statement [not meeting the 'source attribution' criterion (estimated frequency in population of greater than 1 in 1.6×10^{10})] for single source and identifiable major contributors of a mixture:

The DNA profile obtained from the "item description (Item #)" matches that obtained from the blood/oral sample of "name". The probability of selecting an unrelated individual at random from the general population having a DNA profile that would match the DNA profile obtained from "item description (Item #)" is at least less than one in "actual (most conservative of the population groups calculated) frequency estimate".

Partial Profile Statement [profile consistent with item(s) in match statement above]:

The DNA profile obtained from the "item description (Item #)" also matches that obtained from the blood/oral sample of "name", however less genetic information was obtained.

The partial DNA profile obtained from the "item description (Item #)" is consistent with that obtained from the blood sample of "name".

Postive Paternity Statement [profiles consistent with being a biological child]:

Based upon evaluation of the DNA profiles obtained from the above individuals, "name" cannot be excluded as being the biological father of "name". The probability of paternity (assuming a prior probability of 0.5) is "X%" relative to an unrelated man randomly selected from the general population. The combined paternity index for the loci examined is "X". At least "X%" of the male population would be expected to be excluded from the possibility of being the biological father of "name".

Note: The most conservative of the population groups calculated is reported for the statement above.

Mixture Statements:

The DNA profile from "item decription (Item#)" indicates a mixture of DNA from at least "X" persons. "Name(s)" is a potential contributor(s) to this mixture. "X%" of unrelated individuals randomly selected from the general population would be expected to be eliminated as potential contributors to this mixture.

The DNA profile from "item decription (Item#)" indicates a mixture of DNA from at least two persons. "Name(s)" is a potential contributor(s) to this mixture. The DNA profile obtained from "item decription (Item#)" is at least "X" times more likely to be seen if it were the result of a mixture of DNA from "name and name" than if it resulted from "name" and an unrelated individual randomly selected from the general population.

Note: The most conservative of the population groups calculated is reported for the statement above.

The DNA profile from "item decription (Item#)" indicates a mixture of DNA with a discernable major contributor/profile. (include match, consistent with, or exclusionary statement regarding major profile). "name" is included/excluded/cannot be excluded as a possible contributor to the minor DNA component of this mixture.

The DNA profile from "item decription (Item#)" indicates a mixture of DNA from at least "X" persons. "Name(s)" is a potential contributor(s) to this mixture. At least one in "actual (most conservative of the population groups calculated) frequency estimate" unrelated individuals randomly selected from the general population would be expected to be included as potential contributors to this mixture.

Exclusionary Statement:

The DNA profile obtained from the "item description (Item #)" does not match that obtained from the blood sample of "name". Therefore, "name" is not the source (or "a contributor" in a mixed profile situation) of the "(DNA, blood, semen, saliva etc.)" on this item.

The DNA profile obtained from the "item description (Item #)" was determined to be from an unknown male/female. "name" is not the source of the "(DNA, blood, semen, saliva etc.)" on this item.

Based upon evaluation of the DNA profiles obtained from the above individuals, "name" is not the biological father of "name".

No DNA Profile Obtained Statement:

Due to insufficient quantity or degradation, no DNA profile was obtained from "item description (Item #)".

CODIS Entry Statement:

The unknown male/female (included if source is not identified) DNA profile obtained from the "item description (Item #)" was entered into the Combined DNA Index System (CODIS) to be routinely searched against the database. The case agency will be notified in the event of a profile match.

Note: This statement is included when an eligible DNA profile has been developed, regardless of whether the profile is from a known or unknown source. Eligibility of forensic profiles for entry into CODIS and upload to NDIS is according to current NDIS procedures and include both solved and unsolved cases in which the profile is associated with a crime and believed to be attributable to the putative perpetrator. Profiles matching the victim(s) and any elimination samples (e.g. consensual partner samples) may not be entered.

11.3.7 The following statements are to be used in both **biology screening and DNA STR reports:**

Evidence Disposition Section Statements:

The following items have been retained in the laboratory [list all items/portions by description and Item# that have been retained in the DNA Packet (see BI-102)]. All remaining items (include empty evidence containers when the entire item was repackaged and retained) have been returned to the main laboratory evidence vault for return to the submitting agency.

The following items have been forwarded for DNA analysis: [list all items/portions by description and Item# that have been retained in the DNA Packet (see BI-102)]. Results will follow in a separate report. All remaining items (include empty evidence containers when the entire item was repackaged and retained) have been returned to the main laboratory evidence vault for return to the submitting agency.

> *Note: Nonsuspect cases (those with no known/identified suspect) in which biological evidence has been detected, will be forwarded for DNA testing and CODIS entry.*

The DNA packet, which contains any remaining DNA extracts, has been retained in the laboratory. All remaining items have been returned to the main laboratory evidence vault for return to the submitting agency.

Evidence Description Section Examples:

A tape-sealed Sexual Assault Evidence Collection Kit (SAECK) containing biological samples, said to have been collected from "name".

A tape-sealed brown paper bag/manila evidence envelope/white cardboard box/etc. containing "description", *(include the following if collection information is known)* said to have been collected from "name" or "location".

A tape-sealed brown paper bag/manila evidence envelope/white cardboard box/etc. said to contain "label on package", *(include the following if collection information is known)* collected from "name" or "location".

A tape-sealed DNA packet, created in the laboratory on month day, year, and containing the following items:

Item #) "description"
Item #) "description"

11.3.8 It should be noted that the statements (in either the Forensic Biology Screening or DNA Reports) regarding evidence examination, testing and conclusions are not all-inclusive. There may be situations for which none of these statements is optimum.

12.0 REVIEW

Technical/administrative, document, and testimony (to include retention) review; as well as conflict resolution is addressed in the ISP Forensic Services Quality/Procedure Manual. See also, forms 214-BI and 306-BI in this manual.

12.1 BIOLOGY/DNA CASEWORK REVIEW

12.1.1 100% of the examinations and reports documented and/or issued from Forensic Biology/DNA will be "peer-reviewed". This review must be completed prior to issuing results (including verbal results) and/or entering eligible profiles into CODIS. Exceptions for release of results may be made on a case-by-case basis and with the Biology Supervisor's approval.

12.1.2 "Peer-review" in Forensic Biology will encompass both technical and administrative reviews.

12.1.3 The individual performing the "peer-review" will be a second scientist who is "qualified" in the area of the review (i.e., Biological Screening and/or STR Analysis).

12.1.4 It is not sufficient to have the scientist performing/reporting the analysis to be the sole person performing the administrative review.

12.1.5 The second scientist performing the review will initial each page (and date the first and last page at a minimum).

12.1.6 The second scientist will also place their initials below the signature of the scientist issuing the report.

12.1.7 Additionally, the second scientist will review the CODIS Entry Form (Form 218-BI) and verify that all eligible profiles have been identified for CODIS entry and the correct specimen categories have been assigned. The reviewer will date and initial the form. Eligible specimens will not be entered into CODIS until review/verification is complete. The specimen details report will be reviewed and initialed by the CODIS Administrator (or alternate) following manual data entry

and prior to searching at SDIS and uploading to NDIS to verify correct allele entry and specimen category.

12.1.8 Outsourced casework (when applicable) will undergo the same review as listed above, as well as for compliance with contract technical specifications.

12.2 CONVICTED OFFENDER/DATABASE SAMPLE REVIEW

12.2.1 100% of Convicted Offender sample data (including outsourced data when applicable) will be technically reviewed prior to CODIS entry and subsequent NDIS upload.

12.2.2 The individual performing the technical review will be a second scientist who is "qualified" in the area of STR Analysis.

12.2.3 The second scientist performing the review will initial each page of the data package (and date the first and last page at a minimum).

12.2.4 The scientist performing the review of outsourced data (when applicable) will document in an appropriate manner, the review of data for compliance with contract technical specifications and that the .cmf file, if present, contains the correct DNA profiles.

12.2.5 Additionally, a documented administrative review will be performed on CODIS hit confirmation letters containing an offender's personally identifiable information, prior to release.

12.3 TESTIMONY REVIEW

Review of courtroom testimony of Forensic Biology personnel shall be accomplished at least once in each calendar year. Preferably, this review will be performed by the Biology/DNA Supervisor or another qualified analyst and documented on the Forensic Services courtroom testimony evaluation form. Alternatively, the evaluation may be completed by criminal justice personnel (e.g., the judge, prosecutor or defense counsel).

13.0 SAFETY

Laboratory safety practices are addressed in the ISP Forensic Services Health and Safety Manual. In Forensic Biology, personnel are introduced to these practices in Module 1 of the ISP Forensic Biology Training Manual. In addition, Section 8 of this manual addresses the monitoring of the chemical eye-wash and shower.

14.0 AUDITS

Quality audits and retention schedules are delineated in the ISP Forensic Services Quality/Procedure Manual. Specific Biology/DNA audit requirements are delineated below.

14.1 A DNA audit, using the current FBI DNA Quality Assurance Standards Audit Document(s), will be conducted on an annual basis.

14.2 The interval between annual audits will be in accordance with the current FBI Quality Assurance Standards.

14.3 Every other year, at a minimum, the DNA audit must be an external audit.

14.4 The completed audit document(s) (Quality Assurance Standards Audit for Forensic DNA Testing Laboratories and for DNA Databasing Laboratories) and appropriate accompanying documentation will be submitted to NDIS according to NDIS Operational Procedures.

15.0 OUTSOURCING

Outsourcing/Subcontracting policies and procedures are described in the ISP Forensic Services Quality/Procedure Manual.

15.1 Approved vendor laboratories must provide documentation of accreditation and compliance with the Quality Assurance Standards for Forensic DNA and/or Database Testing Laboratories prior to contract award and for the duration of the contract.

15.2 Technical specifications will be outlined in the outsourcing agreement/contract and approved (approval will be documented) by the Biology/DNA Technical Manager prior to award.

15.3 An on-site visit of the vendor laboratory will be performed, by the technical leader or a qualified DNA analyst, and documented prior to the submission of any samples to that laboratory. Alternatively, the technical leader may review and accept (the review and acceptance will be documented) an on-site visit conducted by designated FBI personnel.

15.4 An annual on-site visit will be performed and documented for any contract extending beyond one year.

15.5 When outsourcing convicted offender samples, at least one quality control sample shall be included with each batch. Additionally, at least 5% of the total outsourced samples shall be re-tested and compared for consistency and data integrity.

16.0 Practices, Methods and Forms

The following is a list of general practices/administrative procedures, analytical methods and forms utilized in Forensic Biology. Each follows the numbering scheme of: Biology Screening (1XX), DNA Casework Analysis (2XX), CODIS/Database Analysis (3XX) and QC Functions (4XX).

MBI≡Schemes, generally encompassing many procedures.

MBI-100 EXAMINATION OF BLOODSTAINED EVIDENCE
MBI-102 EXAMINATION OF EVIDENCE FOR SEMEN
MBI-104 EXAMINATION OF EVIDENCE FOR BODY FLUIDS
MBI-200 INDIVIDUALIZATION OF DNA SOURCES BY STR ANALYSIS
MBI-300 INDIVIDUALIZATION OF DNA SOURCES BY STR ANALYSIS

BI≡Analytical Procedures or Individual Processes

BI-100 PROCESSING LIQUID BLOOD
BI-102 DNA PACKETS
BI-104 PHENOLPHTHALEIN TEST FOR BLOOD
BI-105 O-TOLIDINE TEST FOR BLOOD
BI-106 HUMAN BLOOD IDENTIFICATION USING ABACARD® HEMATRACE® TEST
BI-108 SPECIES IDENTIFICATION: OUCHTERLONY DOUBLE DIFFUSION
BI-110 BIOLOGICAL SCREENING: USE OF ALTERNATE LIGHT SOURCE
BI-111 BIOLOGICAL SCREENING: USE OF INFRA RED LIGHT
BI-114 BRENTAMINE TEST FOR ACID PHOSPHATASE
BI-116 SAMPLE EXTRACTION FOR SEMEN IDENTIFICATION
BI-118 SEMEN IDENTIFICATION: MICROSCOPIC EXAMINATION
BI-119 SPERM DOCUMENTATION: MIDEO SYSTEM
BI-120 IDENTIFICATION OF SEMEN BY P30 DETECTION (ABAcard®)
BI-122 AMYLASE TEST: PHADEBAS
BI-124 AMYLASE TEST: STARCH IODIDE
BI-126 DETECTION OF URINE (UREASE)
BI-128 DETECTION OF URINE (CREATININE)
BI-130 DETECTION OF FECAL MATERIAL (UROBILINOGEN)
BI-200 EXTRACTION PROTOCOLS FOR PCR DNA TYPING TESTS
BI-207 DNA QUANTIFICATION: REAL-TIME PCR
BI-208 STR AMPLIFICATION: PP16
BI-210 STR TYPING: CAPILLARY ELECTROPHORESIS AND DATA ANALYSIS
BI-301 OFFENDER SAMPLE RECEIPT AND DNA TRACKER ENTRY
BI-312 EXTRACTION PROTOCOLS FOR PCR DNA TYPING TESTS
BI-314 DNA QUANTIFICATION : REAL-TIME PCR
BI-316 STR AMPLIFICATION : PP16HS

BI-318 STR TYPING : CAPILLARY ELECTROPHORESIS AND DATA ANALYSIS
BI-400 DRIFTCON FFC : TEMPERATURE VERIFICATION
BI-500 CODIS SAMPLE DATA ENTRY AND UPLOAD
BI-501 CODIS DATABASE HIT VERIFICATION
BI-502 CODIS SAMPLE REMOVAL

Form BI≡Various forms used in each discipline
* indicates a controlled form

100-BI PHENOLPHTHALEIN REAGENT (KASTLE-MEYER)
102-BI HYDROGEN PEROXIDE 3% (v/v)
103-BI O-TOLIDINE REAGENT
104-BI AMMONIUM HYDROXIDE (~3%)
108-BI OUCHTERLONY DESTAIN
110-BI OUCHTERLONY STAIN
114-BI 10X BRENTAMINE (SODIUM ACETATE) BUFFER
116-BI BRENTAMINE SOLUTION A
118-BI BRENTAMINE SOLUTION B
120-BI SALINE (0.85% NaCℓ)
124 BI 1X PHOSPHATE BUFFERED SALINE (PBS)
126-BI XMAS TREE STAIN SOLUTION A (KERNECHTROT SOLUTION)
128-BI XMAS TREE STAIN SOLUTION B (PICROINDIGOCARMINE SOLUTION)
132-BI AMYLASE DIFFUSION BUFFER (pH6.9)
134-BI AMYLASE IODINE REAGENT
138-BI MERCURIC CHLORIDE 10% (w/v)
140-BI ZINC CHLORIDE 10% (w/v)
201-BI 1M TRIS-HCℓ BUFFER pH7.5
203-BI 1M TRIS-HCℓ BUFFER pH8
205-BI ETHYLENEDIAMINE TETRAACETIC ACID (EDTA) 0.5M
207-BI STAIN EXTRACTION BUFFER pH8
211-BI PROTEINASE K (20 mg/mℓ)
222-BI 1M SODIUM ACETATE pH5.2
223-BI DTT (1M)
229-BI PCR-TE (TE^{-4}) BUFFER (10mM TRIS-HCℓ, 0.1M EDTA)
231-BI NaOH 5N
233-BI SODIUM CHLORIDE (NaCℓ) 5M
249-BI BOVINE SERUM ALBUMIN (BSA) 4%
101-BI BIOLOGY SCREENING SUMMARY
200-BI DNA EXTRACTION WORKSHEET
202-BI DIFFERENTIAL DNA EXTRACTION WORKSHEET
206-BI* 7500 LOAD SHEET
209-BI* 7500 RESULTS SHEET
210-BI STR AMPLIFICATION SET-UP
212-BI STR EXTRACTION CONTROL GENOTYPE CHECK
214-BI STR TECHNICAL REVIEW CHECKLIST
216-BI* 3130 LOAD SHEET

218-BI CODIS ENTRY FORM
306-BI STR OFFENDER DATABASE REVIEW CHECKLIST
310-BI CODIS SAMPLE REMOVAL CHECKLIST
312-BI* DATABASE WORKSHEETS (A-E)
314-BI OUTSOURCED OFFENDER DATA REVIEW
316-BI DATABASE REINJECTION SUMMARY
400-QC FORENSIC BIOLOGY CHEMICAL INVENTORY
401-QC FORENSIC BIOLOGY CRITICAL EQUIPMENT INVENTORY
402-QC FORENSIC BIOLOGY EQUIPMENT MAINTENANCE/REPAIR RECORD
403-QC* FORENSIC BIOLOGY pH CALIBRATION RECORD
404A-QC* BIOLOGY/DNA CASEWORK WEEKLY QC
404B-QC* EVIDENCE VAULT WEEKLY QC
404C-QC* DNA DATABASE WEEKLY QC
406A-QC* BIOLOGY/DNA CASEWORK MONTHLY QC
406B-QC* FORENSIC BIOLOGY MONTHLY QC
406C-QC* DNA DATABASE MONTHLY QC
408-QC FORENSIC BIOLOGY QUARTERLY QC
410-QC* QC ABACARD® HEMATRACE® KIT
412-QC* QC ONESTEP ABACARD® P30 KIT
419A-QC* QC QUANTIFILER® HUMAN DNA QUANTIFICATION KIT
419B-QC QC PLEXOR® HY QUANTIFICATION KIT
420-QC* QC STR KITS
422-QC 3130/3130xl INJECTION LOG
426-QC* ANNUAL NIST QC RUN
428-QC BIOMEK 3000 QC

DNA Quantitation
7500 Load Sheet

Form 206-BI

Case Number: _____ **Analyst:** _____

Plate Name: _____ **Date:** _____

	1	2	3	4	5	6	7	8	9	10	11	12
A	STD. 1	STD. 1										
B	STD. 2	STD. 2										
C	STD. 3	STD. 3										
D	STD. 4	STD. 4										
E	STD. 5	STD. 5										
F	STD. 6	STD. 6										
G	STD. 7	STD. 7										
H	STD. 8	STD. 8										

Quantifiler Kit

total samples: _____

Master Mix made for: _____

lot #: _____

expiry date: _____

Std. Prep. Date: _____

TE lot#: _____

reaction mix **0** ul

primer mix **0** ul

DNA Quantitation
7500 Results Sheet

Form 209-BI

Case Number: _____ Analyst: _____

Plate Name: _____ Date: _____

Well	Sample Name	IPC C_T	Quantity ng/ul	ul Sample for Dilution	ul TE to be added	ng/ul Final	ul to be Amplified
A3	0	0	0	5	0.0	0.1	10.0
B3	0	0	0	5	0.0	0.1	10.0
C3	0	0	0	5	0.0	0.1	10.0
D3	0	0	0	5	0.0	0.1	10.0
E3	0	0	0	5	0.0	0.1	10.0
F3	0	0	0	5	0.0	0.1	10.0
G3	0	0	0	5	0.0	0.1	10.0
H3	0	0	0	5	0.0	0.1	10.0
A4	0	0	0	5	0.0	0.1	10.0
B4	0	0	0	5	0.0	0.1	10.0
C4	0	0	0	5	0.0	0.1	10.0
D4	0	0	0	5	0.0	0.1	10.0
E4	0	0	0	5	0.0	0.1	10.0
F4	0	0	0	5	0.0	0.1	10.0
G4	0	0	0	5	0.0	0.1	10.0
H4	0	0	0	5	0.0	0.1	10.0
A5	0	0	0	5	0.0	0.1	10.0
B5	0	0	0	5	0.0	0.1	10.0
C5	0	0	0	5	0.0	0.1	10.0
D5	0	0	0	5	0.0	0.1	10.0
E5	0	0	0	5	0.0	0.1	10.0
F5	0	0	0	5	0.0	0.1	10.0
G5	0	0	0	5	0.0	0.1	10.0
H5	0	0	0	5	0.0	0.1	10.0
A6	0	0	0	5	0.0	0.1	10.0
B6	0	0	0	5	0.0	0.1	10.0
C6	0	0	0	5	0.0	0.1	10.0
D6	0	0	0	5	0.0	0.1	10.0
E6	0	0	0	5	0.0	0.1	10.0
F6	0	0	0	5	0.0	0.1	10.0
G6	0	0	0	5	0.0	0.1	10.0
H6	0	0	0	5	0.0	0.1	10.0
A7	0	0	0	5	0.0	0.1	10.0
B7	0	0	0	5	0.0	0.1	10.0
C7	0	0	0	5	0.0	0.1	10.0
D7	0	0	0	5	0.0	0.1	10.0
E7	0	0	0	5	0.0	0.1	10.0
F7	0	0	0	5	0.0	0.1	10.0
G7	0	0	0	5	0.0	0.1	10.0
H7	0	0	0	5	0.0	0.1	10.0
A8	0	0	0	5	0.0	0.1	10.0
B8	0	0	0	5	0.0	0.1	10.0
C8	0	0	0	5	0.0	0.1	10.0
D8	0	0	0	5	0.0	0.1	10.0
E8	0	0	0	5	0.0	0.1	10.0
F8	0	0	0	5	0.0	0.1	10.0
G8	0	0	0	5	0.0	0.1	10.0

Well	Sample Name	IPC C_T	Quantity ng/ul	ul Sample for Dilution	ul TE to be added	ng/ul Final	ul to be Amplified
H8	0	0	0	5	0.0	0.1	10.0
A9	0	0	0	5	0.0	0.1	10.0
B9	0	0	0	5	0.0	0.1	10.0
C9	0	0	0	5	0.0	0.1	10.0
D9	0	0	0	5	0.0	0.1	10.0
E9	0	0	0	5	0.0	0.1	10.0
F9	0	0	0	5	0.0	0.1	10.0
G9	0	0	0	5	0.0	0.1	10.0
H9	0	0	0	5	0.0	0.1	10.0
A10	0	0	0	5	0.0	0.1	10.0
B10	0	0	0	5	0.0	0.1	10.0
C10	0	0	0	5	0.0	0.1	10.0
D10	0	0	0	5	0.0	0.1	10.0
E10	0	0	0	5	0.0	0.1	10.0
F10	0	0	0	5	0.0	0.1	10.0
G10	0	0	0	5	0.0	0.1	10.0
H10	0	0	0	5	0.0	0.1	10.0
A11	0	0	0	5	0.0	0.1	10.0
B11	0	0	0	5	0.0	0.1	10.0
C11	0	0	0	5	0.0	0.1	10.0
D11	0	0	0	5	0.0	0.1	10.0
E11	0	0	0	5	0.0	0.1	10.0
F11	0	0	0	5	0.0	0.1	10.0
G11	0	0	0	5	0.0	0.1	10.0
H11	0	0	0	5	0.0	0.1	10.0
A12	0	0	0	5	0.0	0.1	10.0
B12	0	0	0	5	0.0	0.1	10.0
C12	0	0	0	5	0.0	0.1	10.0
D12	0	0	0	5	0.0	0.1	10.0
E12	0	0	0	5	0.0	0.1	10.0
F12	0	0	0	5	0.0	0.1	10.0
G12	0	0	0	5	0.0	0.1	10.0
H12	0	0	0	5	0.0	0.1	10.0

3130 Load Sheet

Form 216-BI

Case Number: _____ **Analyst:** _____

Plate Name: _____ **Date:** _____

	1	2	3	4	5	6	7	8	9	10	11	12
A												
B												
C												
D												
E												
F												
G												
H												

total samples: _____ **Master Mix made for:** _____

3130 POP4

Lot# _____ HiDi Formamide Lot# _____ HiDi Formamide **0** ul

Expiration Date _____ Buffer Lot# _____ Internal Lane Standard **0** ul

BSD/Biomek 3000 Load Sheet

Form 312A-BI

Plate Name: _____ Analyst: _____

Test Name: _____ Date: _____

Biomek 3000: _____

	1	2	3	4	5	6	7	8	9	10	11	12
A												
B												
C												
D												
E												
F												
G												
H												

Punch Size: 3.2mm Elution Volume (µl): 100

Number of Punches: 3

DNA IQ Kit

Lot #: _____ DTT Lot# / Date Added: _____

Exp. Date _____ Ethanol Lot# / Date Added: _____

2-Propanol Lot# / Date Added: _____

DNA Quantitation
7500 Load Sheet

Form 312B-BI

Plate Name: 1/0/1900

Analyst: 0

7500:

Date:

	1	2	3	4	5	6	7	8	9	10	11	12
A	0	0	0	0	0	0	0	0	0	0	STD. 1A	STD. 1B
B	0	0	0	0	0	0	0	0	0	0	STD. 2A	STD. 2B
C	0	0	0	0	0	0	0	0	0	0	STD. 3A	STD. 3B
D	0	0	0	0	0	0	0	0	0	0	STD. 4A	STD. 4B
E	0	0	0	0	0	0	0	0	0	0	STD. 5A	STD. 5B
F	0	0	0	0	0	0	0	0	0	0	STD. 6A	STD. 6B
G	0	0	0	0	0	0	0	0	0	0	STD. 7A	STD. 7B
H	0	0	0	0	0	0	0	0	0	0	NTCA	NTCB

Plexor HY Kit

Lot #:

Std. Prep. Date:

Quantification Set-Up Method: **Automated**

Exp. Date:

TE lot#:

Biomek 3000:

Manual Master Mix Prepartion

Total Samples:

Master Mix 0 ul

Master Mix made for:

Primer/IPC Mix 0 ul

Water 0 ul

Revision 12
12/7/2011
Issuing Authority: Quality Manager

DNA Quantitation
Plexor HY 7500 Results Sheet

Form 312C-BI

Plate Name: 1/0/1900 **Analyst:** 0

Normalize to Auto/Y: Auto **Date:** 1/0/1900

Samples between 0.125 and 0.136 ng/µl? Split

				Manual Dilution Scheme:		N/A	
Well	**Sample Name**	**PHY Quantity ng/ul**	**PHY IPC Status**	ul Sample for Dilution	ul TE to be added	ng/ul Final	ul to be Amplified
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0

DNA Quantitation
Plexor HY 7500 Results Sheet

Form 312C-BI

Plate Name: 1/0/1900 **Analyst:** 0

Normalize to Auto/Y: Auto **Date:** 1/0/1900

Samples between 0.125 and 0.136 ng/µl? Split

				Manual Dilution Scheme:	N/A		
Well	**Sample Name**	**PHY Quantity ng/ul**	**PHY IPC Status**	ul Sample for Dilution	ul TE to be added	ng/ul Final	ul to be Amplified
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0

DNA Quantitation

Plexor HY 7500 Results Sheet

Form 312C-BI

Plate Name: 1/0/1900

Analyst: 0

Normalize to Auto/Y: Auto

Date: 1/0/1900

Samples between 0.125 and 0.136 ng/µl? Split

				Manual Dilution Scheme:			N/A
Well	**Sample Name**	**PHY Quantity ng/ul**	**PHY IPC Status**	ul Sample for Dilution	ul TE to be added	ng/ul Final	ul to be Amplified
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0
0	0	0.00	0	5	0.0	0.25	2.0

STR Amplification Set-Up

Form 312D-BI

Plate Name: 1/0/1900

Analyst: 0

Thermal Cycler:

Date:

	1	2	3	4	5	6	7	8	9	10	11	12
A	0	0	0	0	0	0	0	0	0	0	POS_CTRL	
B	0	0	0	0	0	0	0	0	0	0	NEG_CTRL	
C	0	0	0	0	0	0	0	0	0	0		
D	0	0	0	0	0	0	0	0	0	0		
E	0	0	0	0	0	0	0	0	0	0		
F	0	0	0	0	0	0	0	0	0	0		
G	0	0	0	0	0	0	0	0	0	0		
H	0	0	0	0	0	0	0	0	0	0		

PowerPlex16 HS Kit

Lot#:

Exp. Date:

STR Amplification Set-Up Method: Automated

Biomek 3000:

Manual Master Mix Preparation

	Reagent	µl/sample	µl in Master Mix
Total Samples:	5x Master Mix	1.25	0
	Primers	0.6	0
Master Mix Made For:	H_20		0
	Master Mix/Sample	1.85	
TE Lot#:	DNA Template	4.4	
	Total Rxn Volume	6.25	

3130xl Load Sheet

Form 312E-BI

Plate Name: 1/0/1900

Analyst: 0

Date: _____

	1	2	3	4	5	6	7	8	9	10	11	12
A	0	0	0	0	0	0	0	0	0	0	POS_CTRL	
B	0	0	0	0	0	0	0	0	0	0	NEG_CTRL	
C	0	0	0	0	0	0	0	0	0	0	LADDER	
D	0	0	0	0	0	0	0	0	0	0	LADDER	
E	0	0	0	0	0	0	0	0	0	0		
F	0	0	0	0	0	0	0	0	0	0		
G	0	0	0	0	0	0	0	0	0	0		
H	0	0	0	0	0	0	0	0	0	0		

Total Samples: _____

Master Mix made for: _____

3130 POP4

Lot#: _____

Expiration Date: _____

HiDi Formamide Lot#: _____

Buffer Lot#: _____

HiDi Formamide	0 ul
Internal Lane Standard	0 ul

Revision 12
12/7/2011
Issuing Authority:Quality Manager

Form 403-QC

FORENSIC BIOLOGY pH CALIBRATION RECORD

(Oakton pH meter, serial #135212)

DATE	INITIALS	STANDARD BUFFER pH 4.01 Reading/lot #	STANDARD BUFFER pH 7.00 Reading/lot #	STANDARD BUFFER pH 10.01 Reading/lot #

A 3-point calibration of the pH meter will be performed at the time of use (*See the Oakton Operating Manual for calibration and pH measurement instructions)*. The analyst will record the date of calibration, their initials, the measured pH value and lot # for each buffer. The measured reading must fall within ±0.50 pH for the calibration to be confirmed by the meter.

Form 404A-QC

BIOLOGY/DNA CASEWORK WEEKLY QC

DATE/INITIALS												
	°C	Min	Max	°C	Min	Max	°C	Min	Max	°C	Min	Max
COMBO F/F CW1												
FRIDGE CW2												
FREEZER CW3												
FREEZER CW4												
FREEZER CW5												
COMBO F/F CW6												
COMBO F/F RP1												

Observed temperatures should be approximately 4°C for refrigerators and approximately –20°C for freezers. The maximum temperature for freezers should be –5 °C. Refrigerators should fall between -1 °C and 7 °C .The temperature control should be adjusted to correct for minor variations; however, If the temperature is not corrected or if it falls significantly outside the target range, it should be taken out of service and maintenance/repair performed as needed. Note: frost-free freezers will have a greater temperature range/higher maximum due to the heating and cooling cycles. Temperature sensitive reagents, in these freezers, should be stored in appropriate containers (such as cryo-boxes) to maintain the desired state.

DATE/INITIALS					
NANOPURE SYSTEM					
°C OVEN A	**set/observed**				
°C OVEN B	**set/observed**				
°C HEAT BLOCK A	**set/observed**				
°C HEAT BLOCK B	**set/observed**				
°C HEAT BLOCK C (prod. rm.)	**set/observed**				
°C HEAT BLOCK D	**set/observed**				

Observed temperatures should fall between ±2°C of the temperature set point. The temperature control should be adjusted to correct for minor variations; however, If the temperature is not corrected or if it falls significantly outside the target range, it should be taken out of service and maintenance/repair performed as needed.

The observed water purity for the Nanopure system should be a minimum of 18.0 mega-ohms. If the purity falls below this point, the cartridges should be changed and the system sanitized as necessary.

Form 404B-QC

MERIDIAN EVIDENCE VAULT WEEKLY QC

DATE/INITIALS											
	°C	Min	Max	°C	Min	Max	°C	Min	Max	°C	Min	Max
FRIDGE VR1												
FRIDGE VR2												
FREEZER VF1												
FREEZER VF2												
FREEZER VF3												
FREEZER VF4												
FREEZER VF5												
FREEZER VF6												
FREEZER VF7												

Observed temperatures should be approximately 4°C for refrigerators and approximately –20°C for freezers. The maximum temperature for freezers should be –5 °C. Refrigerators should fall between -1 °C and 7 °C .The temperature control should be adjusted to correct for minor variations; however, If the temperature is not corrected or if it falls significantly outside the target range, it should be taken out of service and maintenance/repair performed as needed. Note: frost-free freezers will have a greater temperature range/higher maximum due to the heating and cooling cycles.

Form 404C-QC

DNA DATABASE WEEKLY QC

DATE/INITIALS											
	˚C	Min	Max	˚C	Min	Max	˚C	Min	Max	˚C	Min	Max
FRIDGE DB1												
COMBO FF DB2												
FREEZER DB3												

Observed temperatures should be approximately 4°C for refrigerators and approximately –20°C for freezers. The maximum temperature for freezers should be –5 °C. Refrigerators should fall between -1 °C and 7 °C .The temperature control should be adjusted to correct for minor variations; however, If the temperature is not corrected or if it falls significantly outside the target range, it should be taken out of service and maintenance/repair performed as needed. Note: frost-free freezers will have a greater temperature range/higher maximum due to the heating and cooling cycles. Temperature sensitive reagents, in these freezers, should be stored in appropriate containers (such as cryo-boxes) to maintain the desired state.

DATE/INITIALS					
˚C WATER BATH	set/observed				

Observed temperatures should fall between ±2°C of the temperature set point. The temperature control should be adjusted to correct for minor variations; however, if the temperature is not corrected or if it falls significantly outside the target range, it should be taken out of service and maintenance/repair performed as needed.

BIOLOGY/DNA CASEWORK MONTHLY QC

Form 406A-QC

DATE/INITIALS												
AUTOCLAVE												
CLEAN												
STERILIZATION (+)												
STERILIZATION (-)												
LABORATORY AND OTHER EQUIPMENT												
BIOROBOT EZ1s GREASE D-RINGS												
CLEAN CENTRIFUGES												
CLEAN PIPETS												
LAB CLEANED												
EYEWASH CHECK												

*Personnel should initial the duties they perform and date separately, if necessary.

Autoclave sterilization is checked by the observation of microbial growth in the (+) control (non-sterilized) and a lack of growth in the (-) control (sterilized) samples. See the BTSure product insert for test instructions and growth indicators. If sterilization is not achieved, the autoclave should be serviced.

FORENSIC BIOLOGY MONTHLY QC

Form 406B-QC

DATE/INITIALS												
ABI 7500 Instrument Maintenance												
Background Assay/Contamination Check												
System Function Test												
Lamp Status Check												
7500 Computer Maintenance												
Disk Cleanup												
Defragment Hard Drive(s)												
3130/3130XL Maintenance												
Water Seal Trap Flush												
Water Wash Wizard												
Defragment Hard Drive (C & E)												

*Personnel should initial the duties they perform and date separately, if necessary.

Note: See the ABI 7500 Maintenance Guide and/or the April 2007 User Bulletin for additional Instrument Maintenance procedures and pass/fail criteria.

A contamination check will be performed by the background assay. If outliers are observed during the Background Assay (Intensity Value ≥72,000), or fluorescence (red) observed during the block check, the specific well should be identified and cleaned. Rerun the background calibration after wells have been cleaned sufficiently. Note: a 96-well tray with 50ul TE in each well may be used as a background tray.

A block check may be performed prior to the background assay by selecting Instrument > Calibrate. Set the exposure time to 2048ms, lamp control to idle, select Filter A and click Snapshot. Holding the cursor over the fluorescence will give pixel intensity.

If a component fails the function test, a service call should be placed.

If the lamp fails the function test and/or status check, it should be replaced, followed by calibration of ROI, background, optical, pure dye, and instrument verification in that order. Reset the Lamp Timer when complete.

The 7500 Disk Cleanup is performed by selecting Start Menu > Programs > Accessories > System Tools > Disk Cleanup.

7500 Defragmentation is performed by selecting Start Menu > Programs > Accessories > System Tools > Disk Defragmenter.

3130/3130XL Defragmentation is performed by right-clicking on 'My Computer' and selecting 'Manage'. In the tree tab choose Computer Management (local)>Disk Fragmenter>Drive name>Defragment.

DNA DATABASE MONTHLY QC

Form 406C-QC

DATE/INITIALS												
CLEAN CENTRIFUGES												
CLEAN PIPETS												
CLEAN BSD PUNCHER												
CLEAN BIOMEK 3000												
LAB CLEANED												
EYEWASH CHECK												

*Personnel should initial the duties they perform and date separately, if necessary.

Form 410-QC

QC ABACARD® HEMATRACE® KIT

HEMATRACE® KIT LOT:_____ **DATE RECEIVED:**_____

SCIENTIST:_____ **QC DATE:**_____

Perform test as usual with one $2mm^2$ cutting and one 2mm thread from known bloodstain. Record results (include time it took for positive rxn to be visible). If available, attach photo documentation and place in Biology Casework QC binder.

SAMPLE	RXN	TIME (min. sec.)
$2mm^2$ cutting		
2mm thread		
Neg		

The $2mm^2$ cutting sample must have a positive reaction within 10 minutes for passing. The 2mm thread should ideally be positive within 10 minutes but is used primarily as a sensitivity indicator of the given test lot. The kit may still be deemed as passing without a positive result for the thread.

QA/QC PASSED: YES ☐ **NO** ☐

Comments:

Form 412-QC

QC OneStep ABACARD® p30 KIT

ABACARD® p30 KIT LOT:_____ **DATE RECEIVED:**_____

SCIENTIST:_____ **QC DATE:**_____

Perform test as usual with a known semen extract, as well as ~10ng/mℓ (10µℓ of a 1:500 dilution) and ~50ng/mℓ (10µℓ of a 1:100 dilution) of Seri Semen Standard. Record results (include time it took for positive rxn to be visible). If available, attach photo documentation and place in Biology Casework QC binder.

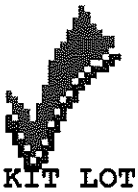
SAMPLE	RXN	TIME (min. sec.)
Semen Extract		
10ng/mℓ		
50ng/mℓ		
Neg		
*250ng/mℓ or 1:10		

The semen extract must have a positive rxn within 10 minutes for passing. The Seri standards are used to estimate the range of sensitivity of the kit lot.

For the semen standard dilutions, if a positive rxn is not obtained at 10 minutes, continue to monitor and record result at the end of 15 minutes. In addition, *run a 250ng/mℓ (50µℓ of the 1:100 dilution to 150µℓ of extraction buffer) **or** a 1:10 dilution of the semen stain extract to ensure the kit is operating within reasonable limits for forensic identification. In addition to the neat semen extract, this control sample (250ng/mℓ or 1:10 extract) must result in a positive rxn within 10 minutes.

QA/QC PASSED: YES ☐ **NO**☐

Comments:



QC QUANTIFILER HUMAN KITS

Form 419A-QC

KIT LOT #:_____ **DATE RECEIVED:**_____

EXPIRATION DATE:_____

SCIENTIST:_____ **QA/QC DATE:**_____

KIT COMPONENT	LOT NUMBER
PRIMER MIX	
REACTION MIX	
DNA STANDARD	

To check the new kit lot, perform quantification as usual. For samples, run standards from the new kit to be QC'd and equivalent dilutions of the NIST SRM 2372 Quant Standard, as well as 0.5ng and 2ng of 9947A DNA. Analyze using the SRM as standard and the new kit as unknown. Using an average of the results for the new kit standards, calculate the new volume of TE to be added in the preparation of standard 1, per the equation $C_1V_1=C_2V_2$ (where C=average for std 1, and V=total volume). Record the slope obtained for the standard curve.

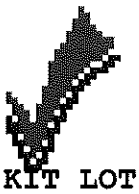
As a check of the calculation and resulting TE volume, use the new kit, with corresponding new dilution to perform a 9947A DNA quantification, according to standard procedure. Use 0.5ng and 2ng and compare the results to those obtained from above. A pass will be achieved if the slopes for both standard curves are comparable.

SRM 2372 component used:_____
Standard curve slope:_____
Volume TE to be used for Standard 1:_____

QA/QC PASSED: YES ☐ **NO**☐

Comments:

Attach the 7500 Load Sheets, Standard Curves, and Results Sheets. Record the calculations in the documentation. Mark the new kit with TE volume for Standard 1 preparation.



QC PLEXOR HY KITS

Form 419B-QC

KIT LOT #:_____ **DATE RECEIVED:**_____

EXPIRATION DATE:_____

SCIENTIST:_____ **QA/QC DATE:**_____

KIT COMPONENT	LOT NUMBER
PRIMER MIX	
MASTER MIX	
DNA STANDARD	

To check the new kit lot, perform quantification as usual. For samples, run standards from the new kit to be QC'd and equivalent dilutions of the NIST SRM 2372 Quant Standard, as well as 0.5ng and 2ng of 9947A DNA. Analyze using the SRM as standard and the new kit as unknown. Calculate the average concentration of the genomic DNA standard provided in the kit. This concentration will be used to define the standard dilution series during data analysis in the Plexor Analysis Software. Record the slope obtained for the standard curve.

As a check of the calculation, the kit standards (using the new concentration value to define the series) will be used to analyze the 9947A and SRM standards. Compare the 9947A results to those obtained from above. A pass will be achieved if the slopes for both standard curves are comparable and the concentration value obtained for the SRM standard is near 50ng/ul.

SRM 2372 component used:_____
Standard curve slope:_____
Genomic DNA Standard Concentration:_____

QA/QC PASSED: YES ☐ **NO** ☐

Comments:

Attach the 7500 Load Sheets, Standard Curves, and Results Sheets. Record the calculations in the documentation. Mark the new kit with standard concentration.

Form 420-QC

QC STR KITS

STR KIT: _____ **DATE RECEIVED:** _____

KIT MANUFACTURER: _____ **KIT LOT #:** _____

LAB LOT#: _____ **SCIENTIST:** _____ **QA/QC DATE:** _____

PP16 KIT COMPONENT	LOT NUMBER	PP16HS KT COMPONENT	LOT NUMBER
PRIMER MIX		10X PRIMER PAIR MIX	
REACTION MIX		5X MASTER MIX	
CONTROL DNA		CONTROL DNA	
TAQ GOLD*		INTERNAL LANE STANDARD	
INTERNAL LANE STANDARD		ALLELIC LADDER	
ALLELIC LADDER			

An Extraction Control, reagent blank and associated controls are to be processed from extraction. A pass will be achieved by obtaining the expected results for each of the samples run and data of acceptable quality (e.g. sufficient RFUs). Comments regarding quality concerns are to be noted as appropriate.

* Taq Gold is purchased separately for PowerPlex 16, but typically at the same time as a new STR kit. If Taq Gold is received separate from an STR kit, the QC of the Taq will be noted on this form (corresponding to the appropriate STR kit lot#) under comments.

The ILS, once QC'd, may be used interchangeably between the PP16 and PP16HS kits, if necessary, as they are the same product. The ladders are not the same product and cannot be switched between kit types.

Run Date: _____ **Run Folder:** _____

QA/QC PASSED: YES ☐ **NO** ☐

Comments:

Attach the appropriate extraction/amplification/Extraction Control forms used and the GeneMapper ID Electropherograms; place in the appropriate QC Binder.

Form 426-QC

ANNUAL NIST QC RUN

SCIENTIST:_____ **QC DATE:**_____

At a minimum of once a year, an 'in-date', certified NIST-SRM standard will be analyzed with our standard procedures. Control or known reference samples may be analyzed simultaneously to 'certify' them for use as NIST QC samples. These samples will be listed in the comments section of this form with lot # and that they were certified. After completion of the QC, the newly 'certified' samples, or their container, will be marked as "NIST Certified" with the corresponding date.

The GeneMapper® ID Data will be analyzed as usual and quality of results will be reflected in the comments or 'passed' areas as appropriate and necessary. Passing results are obtained by achieving the expected results for the given NIST sample(s) and any associated controls. The GeneMapper® ID Electropherograms and an Allele Table will be printed [for the NIST sample(s)] and stored in the section QC binder.

Run Folder: _____

QC PASSED: YES ☐ **NO** ☐

Comments:

Form 200-BI

DNA EXTRACTION WORKSHEET

Scientist _____ **Case#** _____

Blood/Saliva/Tissue **Date** _____ **Items**

		Lot #
1a.	___µℓ SEB	SEB _____
1b.	___µℓ Pro K	ProK _____
2.	200µℓ Chelex	Che _____
3a.	150µℓ FTA	FTA _____
3b.	150µℓ TE	TE _____

Hair **Date** _____

1a.	___µℓ SEB	SEB _____
1b.	___µℓ DTT	DTT _____
1c.	___µℓ Pro K	ProK _____

Bone/Teeth **Date** _____

1a.	500µℓ SEB	SEB _____
1b.	15µℓ Pro K	ProK _____

EZ1 Extraction **Date** _____

1a.	EZ1 Kit	EZ1 _____
1b.	EZ1 Protocol	_____
1c.	Elution Volume	_____

Centricon Concentration **Date** _____

1a.	500µℓ PCIAA	PCIAA _____
1b.	TE	TE _____

Form 210-BI

STR AMPLIFICATION SET-UP

Date: _____ Scientist: _____ STR Kit Type: _____

STR Kit Lot: _____ Taq Lot: _____ Thermal Cycler: _____

Reagent	µℓ/sample	X	Master Mix #Samples	=	µℓ in Master
Rxn Buffer	_____ µℓ		_____		_____
Primers	_____ µℓ		_____		_____
H_2O	_____ µℓ		_____		_____
Taq Gold	_____ µℓ		_____		_____
Master Mix/Sample	_____ µℓ				
DNA Template	_____ µℓ				
Total Rxn Volume	_____ µℓ				

PCR TE Lot# _____

Case(s)

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12
B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12
C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12
D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12
E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	E12
F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12
G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12
H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12

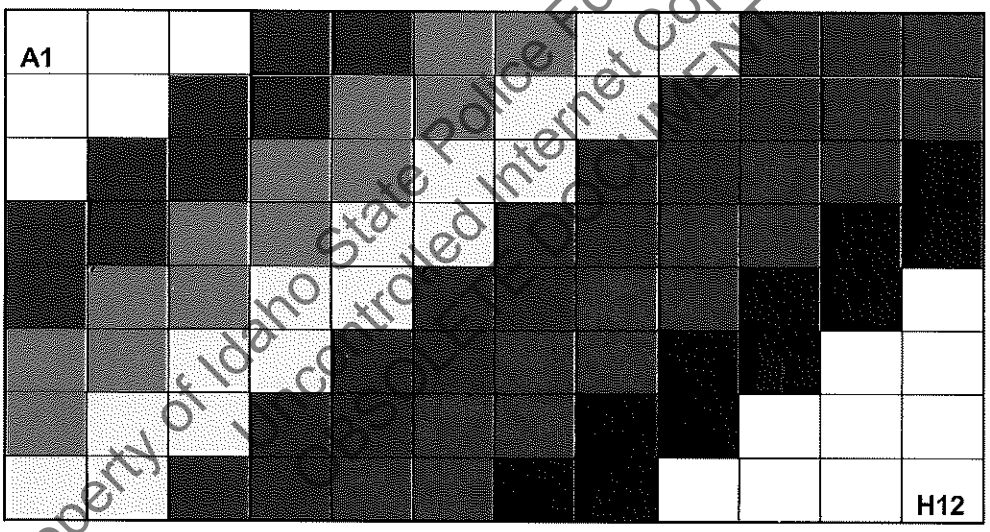
Front

Form 428-QC

QC Biomek® 3000
COLOR PLATE PERFORMANCE CHECK

DATE: _____
TESTED BY: _____

A color plate is to be run as part of a performance check following service, repair, and/or calibration of the Biomek® 3000. Run the Color Plate/Performance Check method in the Biomek Software. The target pattern is shown below. The QC passes if the desired pattern is achieved. Attach photo documentation and place in the QC Binder. Additionally, a calibration/framing check also needs to be performed as part of this performance check. Note in the comments below that the framing was performed, as well as any pertinent comments regarding either of the tests.



QA/QC PASSED: YES ☐ NO☐

Comments: