



Forensic  
Toxicology  
Section Quality  
Manual

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## 1 SCOPE

### 1.1 General

The *ASCL Quality Manual* (ASCL-DOC-001) outlines the policies and procedures under which the laboratory operates. This manual acts as a set of supplemental policies and procedures required to competently perform testing in the Forensic Toxicology Discipline at the Arkansas State Crime Laboratory.

When the section policy does not differ from the labwide policy in any significant manner, the reader will be referred to the *ASCL Quality Manual* for the policy. Where there are additional policies and/or procedures, clarifications, or another basis for further information, then that will be included in this document.

## 2 NORMATIVE REFERENCES

### 2.1 Documents

The following referenced documents inform the foundation of laboratory policies and procedures:

- A.C.A. 5-65-101 through 5-65-311 (as of June 12, 2012)
- A.C.A. 12-12-301 through 12-12-326 (as of June 12, 2012)
- A.C.A. 27-23-113 through 27-23-114 (as of June 12, 2012)
- SOFT/AAFS Forensic Toxicology Laboratory Guidelines (2006 version)
- Scientific Working Group for Forensic Toxicology (SWGTOX) Standard Practices for Method Validation in Forensic Toxicology (Draft revision, June 18, 2012)

Please see Appendix A for the current version of these documents, as of the above-listed dates.

### **3 TERMS AND DEFINITIONS**

#### **3.1 Definitions**

##### **ACCURACY**

The closeness of agreement between a measured quantity value and the true quantity value of a measurand, usually reported as a percent difference. The term *bias* may also be used to describe accuracy.

##### **ADMINISTRATIVE SAMPLING**

An application of sample selection in which samples are selected for testing to meet statutory guidelines.

##### **APPROVAL AUTHORITY**

Personnel that are authorized to review and approve controlled documents.

##### **BLANK MATRIX SAMPLE**

A biological fluid or tissue sample (or synthetic substitute) without target analyte or internal standard.

##### **BLIND TEST**

A test in which the analyst is unaware of the test nature of the sample at the time of analysis.

##### **BLIND TRIAL**

An internally generated sample of composition unknown to the analyst.

##### **CALIBRATION**

A process which establishes a relation between instrument/equipment values and a reference standard or material.

*Examples: calibration of micropipettes and balances to a NIST traceable standard by an outside vendor.*

##### **CALIBRATION MODEL**

A mathematical model that demonstrates the relationship between the concentration of an analyte and the corresponding instrument response.

##### **CARRYOVER**

The appearance of unintended analyte signal in samples after the analysis of a positive sample.

##### **CERTIFIED STANDARD**

A primary standard solution with an externally certified concentration.

##### **CHEMICAL**

A substance or compound that is used for its constant chemical composition and characteristic properties.

*Examples: Acidic/basic solutions, Davidow solution*

### **COMPETENCY TEST**

A test to determine the analytical competence of analyst/examiner trainees prior to performing independent casework. A competency test includes a written test, internal proficiency tests, and moot court (for new employees, or employees training in new sub-disciplines).

### **CONCORDANCE TESTING**

Testing which is an external procurement or exchange of blind and reference samples with another competent laboratory.

### **CONTRACT**

The agreement between the laboratory and the customer.

*Example: The submission sheet is accepted by the ASCL and customer.*

### **CONFIRMED**

The presence if the indicated compound(s) has been shown in two different specimen types, aliquots of the same specimen, or by two analytical techniques based on different principles.

### **CONTROL**

A substance or compound that is utilized to ensure that a method and/or instrument is working as expected.

*Examples: Positive, negative, and cutoff controls*

### **CONTROLLED DOCUMENT**

A document that is distributed in a manner that ensures that the recipients of controlled copies receive subsequent revisions and replace previous controlled copies.

*Examples of controlled documents include: forms required for use by management; Quality and Training Manuals; administrative policies; organizational charts.*

### **CORROBORATION/CORROBORATED RESULT**

A result which has been demonstrated in more than one specimen or testing event, within the quality control constraints of the method. A corroboration may be qualitative or quantitative.

### **CUSTOMER**

The user of our report(s). The customer may be considered to be the criminal justice system or medicolegal system as a whole, or any component part—including the general public. Our most direct customer is generally the submitting entity.

### **CUTOFF CONTROL**

A control which is used to determine whether an assay is considered to be positive or negative by comparison of the response of the unknown to the response of the cutoff control. It is a subclass of positive controls.

### **DECISION POINT**

An administratively defined cutoff or concentration that is at or above the method's limit of detection or limit of quantitation and is used to discriminate between positive and negative results.

### **DETECTED**

The testing has produced a response consistent with the presence of the indicated compound(s) and inconsistent with their absence.

### **DILUTION INTEGRITY**

A determination that accuracy and precision are not significantly impacted when a sample is diluted.

### **DOCUMENT**

Information in any medium including, but not limited to, paper copy, computer disk or tape, audio or videotape, photograph, overhead, or photographic slide.

### **DOCUMENT CONTROL**

The process for ensuring that controlled documents, including revisions, are reviewed, approved and released by authorized personnel, and distributed to personnel performing the prescribed activities. In addition, document control ensures that the current revision is readily available for use and archive copies are stored appropriately.

### **FLUID**

Any biological liquid specimen that is typically pipetted for analysis

### **FORTIFIED BLANK MATRIX SAMPLE**

A blank matrix sample spiked with target analyte and/or internal standard, using reference materials.

### **INTERFERENCES**

Non-targeted analytes (e.g. matrix components, other drugs and metabolites, internal standard, impurities) which may affect the ability to detect, identify, or quantitate a targeted analyte.

### **IONIZATION SUPPRESSION/ENHANCEMENT**

Direct or indirect alteration of, or interference with, instrument response due to the presence of co-eluting compounds.

### **ISSUING AUTHORITY**

Personnel that are authorized to post the approved controlled documents in Qualtrax.

### **LETHAL**

At a concentration where death may occur as a direct result of the presence of the drug.

### **LIMIT OF DETECTION**

An estimate of the lowest concentration of an analyte in a sample that can be reliably detected or identified, but not necessarily quantitated, by the analytical method. This is also referred to as the "detection limit", or "LOD".

### **LIMIT OF QUANTITATION**

An estimate of the lowest concentration of an analyte in a sample that can be reliably differentiated from blank matrix and measured with acceptable accuracy and precision. This is also referred to as the “quantitation limit”, or “LOQ”.

### **LIMIT OF REPORTING**

A concentration (or response) below which an analyte may remain unreported, even though it has been detected. This is also referred to as the “reporting limit”, or “LOR”.

### **LINEAR RANGE**

The concentration range within which it has been demonstrated that instrument response is proportional to the value of the measurand. This is typically the range bounded by the lowest and highest calibrator. Also called the “working range”.

### **MEASURAND**

A quantity that is being determined by measurement.

### **NEGATIVE**

The testing has produced a response insufficient to indicate the presence of the analyte(s) above a threshold amount

### **NEGATIVE CONTROL**

A control for which a negative response is expected.

### **NORMAL**

At a concentration consistent with expected environmental exposure.

### **NOT DETECTED/NONE DETECTED**

The indicated compound(s) have not been detected, but would be expected to if present in significant amounts.

### **NULL HYPOTHESIS**

The default condition, which must be disproven in order to accept the alternative hypothesis.

*Example: the null hypothesis in forensic toxicology is that an analyte is not present. This must be disproven in order to accept the alternative hypothesis, which is that the analyte is present.*

### **PERFORMANCE VERIFICATION**

Confirmation that performance requirements of a measuring system are achieved.

*Examples: balances, internal IR polystyrene compared to a known polystyrene reference to confirm that the instrument/equipment is fit for service.*

### **PER SE LIMIT**

A value above which a specific conclusion is legally warranted (e.g. 0.08 g% blood ethanol value indicates legal intoxication).

### **POSITIVE**

The testing has produced a response sufficient to indicate the presence of the analyte(s) above a threshold amount. Note that “positive” refers to the assay response, not the

presence of the targeted analyte.

**POSITIVE CONTROL**

A control for which a positive response is expected.

**PRACTICABLE**

Able to be accomplished; feasible. "When practicable" means that if it can be reasonably done, then it must be done.

**PRECISION**

The measure of the closeness of agreement between a series of measurements obtained from multiple samplings of the same homogeneous sample. It is expressed numerically as imprecision.

**PRESENT**

The indicated analyte has been detected.

**PROFICIENCY TEST, EXTERNAL**

A test to evaluate the competence of analysts, technical support personnel, and the quality performance of the laboratory conducted by an independent agency.

**PROFICIENCY TEST, INTERNAL**

A test to evaluate the competence of analysts, technical support personnel, and the quality performance of the laboratory conducted by the laboratory itself.

**QUALITY RECORDS**

Quality records include any documents that provide documented support to the conformity to the quality management system. Labwide records include, but are not limited to, reports from internal audits, controlled document review and approval, management reviews as well as records of corrective and preventive actions. Discipline specific records include, but are not limited to, method and equipment verification records, reagent and chemical QC logs, training records, proficiency and competency test records, courtroom testimony monitoring records, chemical inventory records, reference collection records and audit records.

**QUALTRAX**

An intranet framework which provides a secure repository of controlled documents and forms, workflows, and additional functionality.

**REAGENT**

A substance or compound that is added to a system in order to bring about a chemical reaction or is added to see if a reaction occurs.

*Examples: Marquis, Duquenois-Levine, Ninhydrin, Phenothalin, Sodium rhodizonate solution*

**RECORD**

Document that states results and provides documented support of activities performed. These records include, but are not limited to, equipment logs, reagent and chemical QC logs, analytical worksheets, training logs, proficiency and competency test logs, courtroom testimony monitoring logs and corrective action requests.

### **RECOVERY**

The extraction efficiency of an analytical process, reported as a percentage of the known amount of an analyte carried through the sample extraction and processing steps of the method.

### **RE-EXAMINATION TEST**

A test in which a previously examined sample is re-analyzed by a different analyst or examiner.

### **REFERENCE MATERIAL**

A material that is traceable and normally accompanied by documentation issued by an authoritative body that is used for the calibration, performance verification or adjustment of measurement devices.

*Examples: drug standards, chemicals such as PFTBA for autotuning the GC-MS.*

### **REFERENCE STANDARD**

A standard that is traceable through calibration of other measurement standards and is used for the calibration, performance verification or adjustment of other measurement devices.

*Examples: NIST traceable weights and rulers*

### **REQUEST**

The process utilized by a customer when seeking analysis by the laboratory.

*Example: This occurs when the customer completes an evidence submission sheet and provides associated evidence to the ASCL.*

### **ROBUSTNESS**

The measure of an analytical method's resistance to result changes when minor deviations are made in the experimental conditions described in the method. It provides an indication of the method's reliability given the small changes that are expected to occur during routine use.

### **SAMPLE SELECTION**

A plan of selecting a sample(s) of the whole based upon training, experience and competence. Sample selection answers questions only about the portion tested. There is no assumption of homogeneity of the whole.

*Example: Pair of pants with four stains—one stain is chosen to be tested, based on the analyst's experience.*

### **SAMPLING**

A process in which a portion of a substance, material or product is taken for testing to serve as a representative of the whole.

*Example: Testing an amount of white powder and reporting the results for the whole sample.*

### **SPLIT SAMPLES**

A homogeneous sample portioned out for separate analysis.

**STABILITY**

The analyte's resistance to chemical change in a matrix under specific conditions for given time intervals.

**STANDARD**

A substance of known quantity and/or quality.

**SUBTHERAPEUTIC**

Below a concentration where a drug produces its intended effect.

**TECHNICAL RECORDS**

Technical records (i.e. case records) include all examination and administrative documentation as part of individual laboratory case files.

**TENDER**

The laboratory's response to the customer regarding their request.

*Example: This occurs when the ASCL initials the receipt of evidence on the submission sheet and enters the case information into LIMS.*

**TEST ITEM**

A piece of evidence submitted to the laboratory for testing.

**THERAPEUTIC**

At a concentration where a drug produces its intended effect.

**TISSUE**

Any solid biological specimen that is generally weighed (massed) for analysis.

**TOXIC**

At an increased concentration where deleterious effects may appear in addition to the intended effects of the drug.

**UNCERTIFIED STANDARD**

A standard solution which does not have an externally certified concentration

**UNCONTROLLED COPY**

A copy of a controlled document provided for informational purposes only. Examples include copies provided to external inspectors or copies required for legal discovery.

**VERIFICATION**

An independent examination, by a second qualified analyst, to evaluate the conclusions of the primary analyst.

### 3.2 Abbreviations list

These abbreviations are standard abbreviations and may be used in case files without further explanation. Other abbreviations may be used if they can be unambiguously understood by an external reviewer.

- A: acid extraction
- AB: antemortem blood
- AF: Abdominal fluid
- AK: acid blank
- AM: antemortem
- B: base extraction
- BBA: blood blank acid
- ABK: acid blank
- BBB: base blood blank
- BBK: base blank
- BBU: urine blank
- BK: blank
- BL: bile
- BLK: blank
- BR: brain
- CB: cavity blood
- CL: blood clot
- cont: containing
- cont'd: continued
- CS: cerebrospinal fluid
- CSF: cerebrospinal fluid
- CV: cavity fluid
- GS: gastric contents
- HB: heart blood
- hs: heat-sealed
- KD: kidney
- LN: lung
- LV: liver
- ME: manila envelope
- mip: marked in part
- MS: muscle
- ND: none detected
- NDD: no drugs detected
- neg: negative
- NL: not labeled
- N/L: not labeled
- p: page
- PB: peripheral blood
- pg: page
- PL: pleural fluid
- pls: plastic
- pos: positive
- PR: pericardial fluid
- QNS: quantity not sufficient
- SB: stat blood
- SD: subdural
- STC: said to contain
- UB: unknown blood
- UL: unknown liquid
- UR: urine
- VT: vitreous humor
- (curled arrow): containing
- (p with dot above it): marked in part

## 4 MANAGEMENT REQUIREMENTS

### 4.1 ORGANIZATION

#### 4.1.1 Establishment

The Forensic Toxicology Section was established as part of the Arkansas State Crime Laboratory by Act 517 of 1977.

#### 4.1.2 Accreditation

The Forensic Toxicology Section complies with the requirements of the labwide quality system which is designed to maintain compliance with ASCLD/LAB-International program requirements.

Accreditation helps us demonstrate our continuing commitment to providing a demonstrably high quality work product.

#### 4.1.3 Laboratory Facilities

The Forensic Toxicology Section is located within the main laboratory facility in Little Rock, Arkansas. All analytical testing is performed at this location.

#### 4.1.4 Laboratory Status

The Arkansas State Crime Laboratory is an independent state agency, operating under the direction of the Executive Director and the Crime Laboratory Board, who in turn report to the Governor.

##### 4.1.4.1 Personnel Qualifications, Authorities, and Responsibilities

###### 4.1.4.1.1 Chief Forensic Toxicologist

###### Qualifications

This position requires the formal education equivalent of a bachelor's degree in chemistry, biology, or a related field, five years' experience in a chemical laboratory (including two years as a forensic toxicologist), and one year in a leadership capacity. A master's degree can be substituted for all or part of these basic requirements upon approval of the Executive Director and the Scientific Operations Director. The Chief Forensic Toxicologist, or a designee, will have appropriate technical training and experience in forensic toxicology.

###### Authorities and Responsibilities

- Providing administrative oversight for the operation of the analytical section
- Supervising a staff of forensic toxicologists
- Performing annual performance evaluations
- Ensuring compliance with the quality system
- Addressing employee concerns
- Providing technical support and guidance
- Preparing and approving purchase requisitions

- The authorities and responsibilities of a forensic toxicologist, as listed below

#### **4.1.4.1.2 Forensic Toxicologist**

##### **Qualifications**

This position requires the formal education equivalent of a bachelor's degree in chemistry, biology, or a related field, and knowledge of the principles of chemistry and chemical analysis.

##### **Authorities and Responsibilities**

- The analysis of biological samples for the presence and levels of alcohol, drugs, and other toxic substances
- The documentation of these analyses for future reference
- The generation of a report of laboratory analysis based on the analyses conducted
- Testifying as an expert witness as needed regarding the results of laboratory analysis
- Providing technical assistance to outside agencies on sample handling and general information on toxicological analysis
- Routine and preventative maintenance on laboratory equipment
- Attending staff meetings, professional meetings, and seminars
- The development and validation of new analytical procedures
- Technical and administrative review of case files
- Other duties as assigned

#### **4.1.5 Laboratory Responsibilities**

The Forensic Toxicology Section shares the policies and procedures outlined in § 4.1.5 of the labwide quality manual, as applicable.

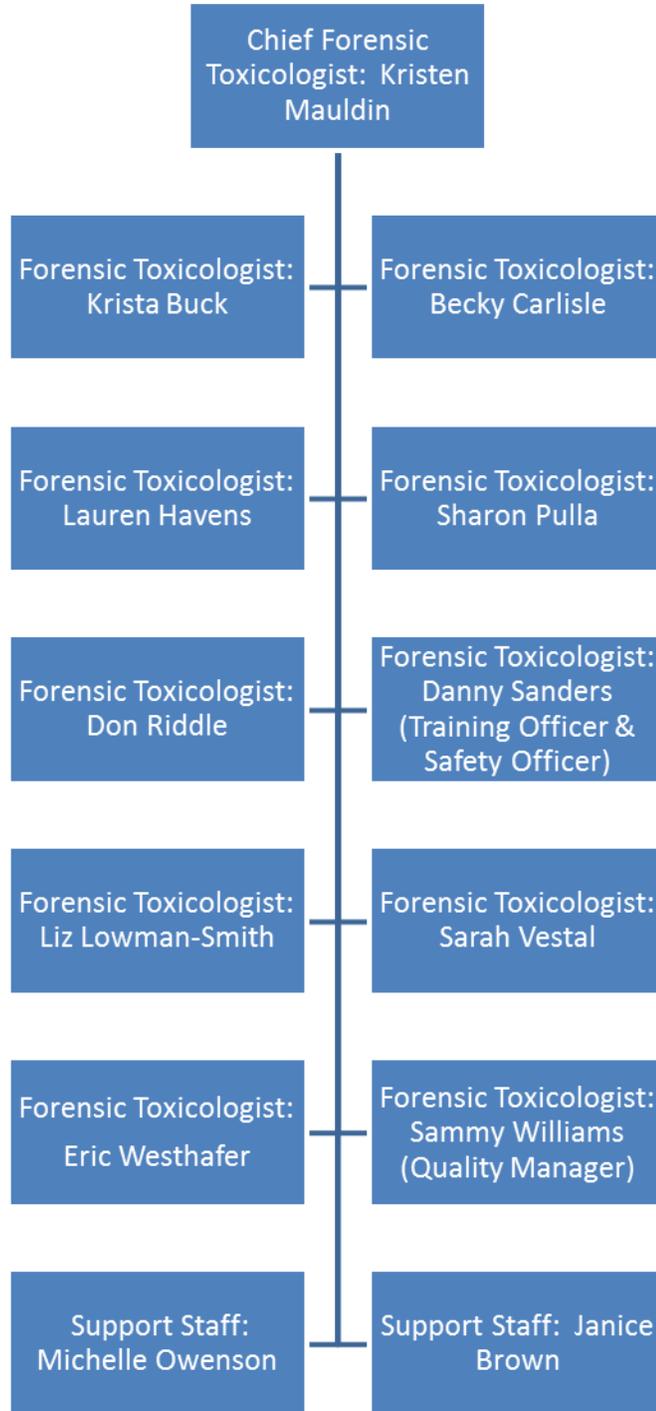
In addition to the items listed in § 4.1.4.1.1 of this manual, the Chief Forensic Toxicologist has the authority required to:

- maintain, implement, and improve the management system
- identify departures from the management system
- initiate actions to prevent or minimize such departures
- The Forensic Toxicology Section Quality Manager has the authority required to:
  - monitor compliance with the quality system through monitoring of activities and evaluation of records
- maintain quality records
- The Forensic Toxicology Section Safety Manager has the authority required to:
  - monitor compliance with the health and safety system
  - maintain health and safety records

#### **Management Structure**

The organizational structure of the Forensic Toxicology Section conforms to that contained in the labwide quality manual (ASCL-DOC-01). Within the section, each Forensic Toxicologist reports directly to the Chief Forensic Toxicologist.

The chain of command must be followed whenever possible. All concerns and grievances must first be addressed with the immediate supervisor—skipping organizational levels is prohibited. The organizational structure is as follows:



If the Chief Forensic Toxicologist will be absent from the laboratory for three or more days, then a deputy will be appointed, and this appointment will be communicated to all affected personnel.

#### **4.1.6 Communication**

##### **4.1.6.1 Internal Communication**

Meetings between administration and section chiefs are normally held at the beginning of each month to ensure that information is regularly distributed to the analytical sections. The section chief will then schedule a section meeting, as necessary, to convey the relevant information to the section. Information may also be conveyed through email, or verbally in an impromptu meeting with one or more appropriate personnel.

##### **4.1.6.2 External Communication**

All communication with parties outside the laboratory must be in compliance with A. C. A. §12-12-312 and laboratory policy. Work-related emails to these external parties may be copied (by CC or BCC) to the section chief.

## **4.2 MANAGEMENT SYSTEM**

### **4.2.1 Forensic Toxicology Section Quality Manual**

The purpose of the Forensic Toxicology Section Quality Manual is to document the policies and procedures of the analytical section. This document is readily available to all laboratory personnel via Qualtrax, and on the website to the public. This manual is reviewed annually by the Chief Forensic Toxicologist and updated as needed to reflect any changes in policies or procedures.

It is recognized that unforeseen circumstances may arise which require immediate deviations from the policies and procedures of this manual. If this deviation affects many cases, the request for an exception to policy will be submitted in writing to the Chief Forensic Toxicologist, or designee, and the request must include an adequate description of the circumstances requiring the action, a statement of the proposed alternative policy and procedure, and the intended duration of the exception. The Chief Forensic Toxicologist will maintain documentation of the approved policy exception. Deviations which only affect a small number of cases may be documented in the case file(s) without the aforementioned requirements.

New policies may be approved and distributed by the section chief, as may interpretations, clarifications, or expansions of existing policies. Changes to any manual require a revision of the affected document through the Qualtrax system. Interpretations and clarifications of existing policy will be distributed in writing to all those effected, and maintained in the *Memoranda* folder on the shared Toxicology drive.

### **4.2.2 Mission**

The mission of the Forensic Toxicology Section is to provide timely, reliable, and appropriate toxicology services to its customers. These customers include medical examiners, coroners, law enforcement personnel, and the criminal justice system as a whole. These services include toxicological analysis, consultation, and testimony.

### **4.2.3 Supporting Manuals**

This Forensic Toxicology Section Quality Manual documents policies and procedures specific to the discipline. Other supporting manuals include:

- *ASCL Quality Manual* (ASCL-DOC-01)
- *ASCL Personnel Handbook* (ASCL-DOC-02)
- *ASCL Health and Safety Manual* (ASCL-DOC-08)
- *Forensic Toxicology Section Training Manual* (TOX-DOC-02)

These manuals will be reviewed annually and revised as needed. They are available at all locations where they are essential to the effective functioning of the laboratory (i.e. the Forensic Toxicology Section).

Each employee reviews the *ASCL Code of Ethics Policy* and the *Acceptable Computer Use Policy* on an annual basis, and they are discussed with the supervisor.

### **4.3 DOCUMENT CONTROL**

The Forensic Toxicology Section complies with the lab-wide policy regarding document control. All discipline-specific documents will be prepared by personnel having adequate expertise in the subject. The preparer will be responsible for:

- Preparing the document on the proper format
- Ensuring that the document is complete and unambiguous
- Addressing comments from reviewers

The Section Chief will then approve the document. The Section Chief is responsible for:

- Reviewing all discipline-specific controlled documents for:
  - Content
  - Scientific suitability
  - Compliance with labwide policies and procedures
- Approving all discipline-specific controlled documents

After approval, the QA Manager will review the documents for compliance to labwide policies and procedures and approve them.

All controlled documents will be reviewed at least annually.

Qualtrax contains the official version of all controlled documents. Unofficial copies of controlled documents may be made for personal use, but care must be taken to ensure that the most current revision is used. Each copy of these documents will contain the revision date so that the status of the document can be determined.

All controlled documents will be available wherever work is performed. Qualtrax is available to any Forensic Toxicology Section user on any computer on the labwide network.

Employees will destroy outdated documents when new revisions become available, or clearly mark them as obsolete. It is the employee's responsibility to ensure that they are using the current revision of any controlled document. Any change to a Quality Manual, Health and Safety Manual, or Personnel Handbook requires a revision to the document.

## **4.4 REVIEW OF REQUESTS, TENDERS, AND CONTRACTS**

### **4.4.1 General**

Once accepted by the laboratory, the laboratory agrees to test submitted evidence in accordance with laboratory policies and procedures as described in this manual.

By completing and submitting the submission sheet, each customer relinquishes all decisions regarding analytical processing and the choice of methods to the laboratory.

Any testing for which there is not a validated method must be approved in writing by the Chief Forensic Toxicologist, by placing their initials and the date by on the ASCL Evidence Submission Form next to the request.

### **4.4.2 Review of Requests**

Before analysis begins, the analyst reviews the request to determine what testing is appropriate. There is no requirement to perform the specific testing requested by the customer on the *ASCL Evidence Submission Form* (ASCL-FORM-12), but the request (and its purpose, if known) guides the decision as to what testing is appropriate.

The Medical Examiner Section is considered an internal customer, and the review of their requests, tenders, and contracts may be performed in a simplified manner. The *Medical Examiner/Forensic Toxicology Section Submission Form* (TOX-FORM-01) contains a detailed list of analysis types, and a cursory review of the requested testing will be made by the analyst when deciding the course of analysis. No record of this review is necessary.

The actual testing performed for the Medical Examiner Section may differ from the analysis requested on their submission form. If this deviation is routine (e.g., not testing multiple specimen types for volatiles if the blood is negative), then such changes do not require notification of the requesting pathologist. Other, more substantive changes to the requested testing may require notification of the requesting pathologist (or the Chief Medical Examiner if the requesting pathologist is not available).

### **4.4.3 Subcontracted Work**

The review of the customer's request, as stated above, will also cover any work which is subcontracted to another laboratory.

### **4.4.4 Deviations**

Although the laboratory is responsible for determining what testing is appropriate and necessary, the customer will be notified if a request for analysis is canceled altogether. This notification may be by telephone, electronic mail, facsimile, a request status of "canceled" on iResults, or the equivalent.

### **4.4.5 Amendments**

All affected personnel will be notified if the contract needs to be amended after work has begun.

## **4.5 SUBCONTRACTING OF TESTS AND CALIBRATIONS**

### **4.5.1 General**

The Forensic Toxicology Section complies with the lab-wide policy regarding subcontracting.

The Forensic Toxicology Section will occasionally subcontract testing to an outside laboratory. Any such testing must be approved by the laboratory fiscal officer before the testing is undertaken (using an *Inter-Laboratory Evidence Transfer Form (ASCL-FORM-07)*). Testing must be performed by a qualified and approved laboratory. A register of approved subcontractors is maintained by the Quality Assurance Manager.

#### **4.6 PURCHASING SERVICES AND SUPPLIES**

The Forensic Toxicology Section complies with the lab-wide policy regarding purchasing.

If a material or service must meet certain specifications in order to properly function in testing, these items and the required specification(s) will be communicated to the Procurement Section, generally through Qualtrax.

Supplies, reagents and consumable materials that affect the quality of tests are not used until they have been verified to meet the previously-defined specifications. Inconsistencies will be reconciled before materials are utilized in casework.

As chemicals are first opened in the section, the opener is responsible for initialing and dating the container. Supplies, reagents and consumable materials shall be stored in accordance with the manufacturer's recommendations.

Critical consumables, supplies, and services which affect the quality of testing will be obtained from reliable suppliers.

In the Forensic Toxicology Section, the critical consumables are:

- Certified standards/reference materials
- Immunoassay kits
- PFTBA (perfluorotributylamine) GC-MS tuning compound

In the Forensic Toxicology Section, the critical supplies are:

- Certified reference mass (for balance adjustment)

#### **4.7 SERVICE TO THE CUSTOMER**

The Forensic Toxicology Section complies with the lab-wide policy regarding service to the customer.

#### **4.8 COMPLAINTS**

The Forensic Toxicology Section complies with the lab-wide policy regarding complaints.

#### **4.9 CONTROL OF NONCONFORMING TESTING**

The Forensic Toxicology Section complies with the lab-wide policy regarding control of non-conforming testing.

#### **4.10 IMPROVEMENT**

The Forensic Toxicology Section strives to continually improve the effectiveness of its quality management system. To this end, the following activities are planned:

- An annual review of the quality management system
- Annual internal or external assessments
- A consideration of employee suggestions
- Evaluation of our work product through full technical and administrative review of all case files
- Evaluation of any received customer survey comments

Changes to this quality manual may be initiated by any employee of the laboratory presenting the suggested change to the Chief Forensic Toxicologist for evaluation, preferably in writing. Changes to the quality manual are accomplished using the procedures outlined in § 4.3, *Document Control*.

#### **4.11 CORRECTIVE ACTION**

The Forensic Toxicology Section complies with the lab-wide policy regarding corrective action.

#### **4.12 PREVENTIVE ACTION**

The Forensic Toxicology Section complies with the lab-wide policy regarding preventive action.

## **4.13 CONTROL OF RECORDS**

### **4.13.1 General Requirements**

#### **4.13.1.1 Records Procedures**

The Forensic Toxicology Section complies with the lab-wide policy regarding the control of records (see § 4.13 of the *ASCL Quality Manual* (ASCL-DOC-01)).

#### **4.13.1.2 Record Storage and Retention**

Technical records (e.g., case records) are maintained in the LIMS. Once reviewed, this becomes the official case record, and will be maintained indefinitely.

Quality records (e.g., logbooks) are kept near the instrument to which they are associated, in the laboratory area, or in the office area.

#### **4.13.1.3 Records Security**

Case records are maintained in the LIMS, which requires a username and password to access. The confidentiality of records is governed by A. C. A. §12-12-312 (see § 2: Normative Documents, and § 4.13.1.3 of the *ASCL Quality Manual* (ASCL-DOC-01)). The scope of covered material includes any records, files, and information kept, obtained, or retained by the laboratory.

#### **4.13.1.4 Electronic Records Protection**

Access rights to the LIMS are determined by management, and are limited to those employees who require access to perform their job function(s).

### **4.13.2 Technical Records**

#### **4.13.2.1 Records Retention**

Case records are stored indefinitely. Quality records (e.g., logbooks) are stored for at least one full ASCLD-LAB-International accreditation cycle (i.e., four years). The following items are retained for at least eight years:

- Proficiency test records
- Corrective action documentation
- Assessment records
- Training records
- Continuing education documentation
- Court testimony monitoring records

#### **4.13.2.2 Date Recording of Technical Data**

The results worksheet contains the first and last dates of testing. The first date of testing is considered to be the date when the procedure for the first test was started. The last date of testing is considered to be the date when the last test was completed—when the analyst knows that no further analysis is needed to generate the report of laboratory analysis.

Additionally, much of the data contained in the case record is output from computerized data systems, and contains the date that the data was acquired.

#### **4.13.2.3 Technical Data Corrections**

The Forensic Toxicology Section complies with the lab-wide policy regarding the correction of technical data, which includes all alterations, including additions.

#### **4.13.2.4 Other Requirements**

The operating parameters of each instrumental method will be stored within the instrument log book which is located in the instrument room. The date range when each method was in use will be clearly identified.

When data from multiple cases is recorded on a single printout, kept in a single file, and referenced for all files for which data was generated, the case number for each case for which data was generated will be recorded on the printout. When the printout is placed in each of the appropriate case records, only the individual case number is required.

When a verification is performed by a second analyst, the verification must be recorded in the case record (verifier and date). If the verifier disagrees with the primary analyst's conclusion then this must also be recorded in the case record.

When more than one analyst assists with an assay, the assisting analyst (or trainee) will initial the data sheets with their initials in parentheses, so that the identity of the analyst responsible for the data is unambiguous.

#### **4.14 INTERNAL AUDIT**

The Forensic Toxicology Section complies with the lab-wide policy regarding internal audits.

#### **4.15 MANAGEMENT REVIEWS**

The Forensic Toxicology Section complies with the lab-wide policy regarding management reviews.

## 5 TECHNICAL REQUIREMENTS

### 5.1 REAGENTS, CHEMICALS, AND STANDARDS

The Forensic Toxicology Section complies with the lab-wide policy regarding reagents, chemicals, and standards. General safe-handling guidelines may be found in the *Health and Safety Manual* (ASCL-DOC-08).

Reagents, chemicals, and standards are of known quality and are subject to quality control requirements to ensure that they are fit for use.

Except where otherwise noted, purchased chemicals should be of ACS Reagent grade or better.

Water used for aqueous preparations should be deionized whenever possible.

Reference materials used for controls must be verified to ensure that they are fit for use. Acceptable methods of verification include a certificate of analysis, characterization by mass spectrometry (to detect the compound and any breakdown products), infrared spectroscopy (to detect the compound and any IR-active contaminants), comparison to a known standard by gas chromatography, or similar. Records of all verifications will be kept in the Toxicology shared drive in the *Certificates of Analysis* directory.

Reference materials, such as CRMs, will be stored in the manner listed by their manufacturer, or another similar manner intended to protect the material from deleterious change, when practicable. If they are transported, care will be taken to ensure that their storage conditions are appropriate during transport.

All controls will be logged in a logbook with the following information:

- Source
- Lot number, if available
- Date received/prepared
- Unique identifier
- Expiration date, if appropriate
- Verification results, if appropriate

When a new reference material is received, the following procedure is followed:

1. Mark the container with the date received and the initials of the person who received it.
2. Add an entry in the *Standard Verification Log* (TOX-FORM-007) listing the form of the material received, the vendor, the part and lot numbers, the date of receipt, and the stated purity (if known).
3. Ensure that the reference material is verified before analytical results based on it are released. A certificate of analysis suffices for verification. If no Certificate of Analysis is available then an unextracted sample of the reference material may be analyzed using mass spectrometry or infrared spectroscopy to evaluate whether the composition of the reference material is consistent with the stated purity.

When a chemical or reagent is prepared, its fitness for use must be demonstrated. This can be achieved by use in an assay if:

1. It is run for comparison with the same chemical or reagent which was previously verified, or
2. Positive and negative controls are analyzed in the assay and respond appropriately.

When a new reference material solution is prepared, the following procedure is followed:

1. Add an entry to the Standard Preparation Log (TOX-FORM-006) listing the drug name(s), vendor(s), preparer, lot number(s), preparation date, the solvent(s) used, the final concentration(s) of the reference material, an expiration date (generally one year), and a description of the method of preparation.
2. A standard number is assigned to the reference material. This number is generally assigned sequentially.
  - a. The standard number is prepended with an alphabetical code to give information about the standard .
    - i. CE for standards purchased from Cerilliant
    - ii. GR for standards purchased from Grace
    - iii. ET for ethanol standards
    - iv. TM for test mixes
    - v. MX for other mixed standards
    - vi. Other abbreviations, as needed
  - b. The standard number is appended with an alphabetical code to indicate the concentration of the component(s)
    - i. A for a 1 mg/mL solution, and increment the letter by one for each 1:10 dilution
    - ii. In a mixture, the highest concentration determines the suffix
    - iii. X, Y, and Z are reserved for cases where the appropriate suffix is unclear
    - iv. Subsequent preparations of dilutions from the same stock will append an incremented number (e.g., the second preparation of CE123C would be labeled CE123C2, and entered separately into the Standard Preparation Log)
3. If the reference material is used to make a calibration curve, or as a positive control in the initial verification of a calibration curve, the result(s) of this analysis are evaluated. Any reference materials which are found to be unsuitable for quantitative use will be discarded, or clearly labeled as for qualitative use only.

## 5.2 Personnel

### 5.2.1 General

The Forensic Toxicology Section complies with the lab-wide policy regarding personnel matters.

The Chief Forensic Toxicologist ensures the competence of all personnel who operate specific equipment, perform analyses, evaluate, review or verify results, or issue reports of laboratory analysis in this category of testing. This is accomplished by:

- Requiring the successful completion of a baccalaureate degree program in chemistry, biology, or other natural science or closely-related field
- Requiring the successful completion of the Forensic Toxicology Section training program, including a competency test and moot court
- Verifying ongoing compliance through full technical and administrative review of casework

#### 5.2.1.1 Training Program

Each Forensic Toxicologist, regardless of prior training or experience, must complete a training program prior to assuming casework responsibilities. For analysts with prior experience, this training may be truncated with the approval of the Chief Forensic Toxicologist and the Scientific Operations Director.

The training program is detailed in the *Forensic Toxicology Section Training Manual* (TOX-DOC-002). Among the contents of this training are:

- Health and safety requirements
- Laboratory policies and procedures
- Instrumentation theory and practice
- Evidence handling and sampling procedures
- Analytical techniques and instrumentation
- Ethics in Forensic Science
- Criminal/civil law procedures
- Moot court
- Quality system requirements
- Interpretation and reporting
- General knowledge of Forensic Science
- Competency testing

Records will be maintained which document what training has occurred, and the evaluation(s) of that training.

Written tests will occur to document the trainee's knowledge of the subject material.

A (possibly) truncated version of this training program can also serve as the basis for remedial or refresher training of existing employees.

Training on new procedures will be documented for existing employees as the new

procedure(s) are brought on line. Training will include observation of the method and, if appropriate, a successful proficiency test. Both observation and completion of a proficiency test will need to be documented in the employees training binder.

### **5.2.2 Employee Development Program**

The Forensic Toxicology Section complies with the lab-wide policy regarding employee development.

### **5.2.3 Personnel Employment**

The Forensic Toxicology Section complies with the lab-wide policy regarding personnel employment.

### **5.2.4 Job Descriptions**

The Forensic Toxicology Section complies with the lab-wide policy regarding job descriptions.

### **5.2.5 Authorization Documentation**

The Forensic Toxicology Section complies with the lab-wide policy regarding authorization documentation.

### **5.2.6 Technical Personnel Qualifications**

#### **5.2.6.1 Education**

Forensic Toxicologists will possess a baccalaureate degree in chemistry, biology, or other natural science or closely-related field.

#### **5.2.6.2 Competency Testing**

The competency specimens in the Forensic Toxicology Section are intended to mimic typically encountered specimens. They encompass a range of specimen types and analyte classes. It is not necessary to include every test method in the competency test, but commonly-performed test methods will be represented. A written report will be generated and evaluated as though it were a normal case.

### **5.2.7 Literature**

The Forensic Toxicology Section encourages the distribution and review of current literature. Literature is distributed in several ways:

- A literature folder is provided on the shared Toxicology network drive
- A literature folder is provided on Qualtrax
- Literature may be distributed by email

### **5.3 ACCOMMODATION AND ENVIRONMENTAL CONDITIONS**

The Forensic Toxicology, Illicit Labs, and Forensic Chemistry Sections are accessible to members of the Forensic Toxicology, Forensic Chemistry, Illicit Labs, and Trace Evidence Sections due to the physical layout of the laboratory. Access to the Forensic Toxicology Section is restricted at all times to authorized personnel, which includes members of the above-listed sections. This is accomplished by means of magnetically-locked doors which prevent access from the central hallways without a security access card. Because the lab area is secured at all times in this manner, the doors inside the Forensic Toxicology section need not be locked either during working hours or after working hours. Section refrigerated specimen storage is a common storage area which is locked when not in use or under direct observation. Keys are distributed to authorized personnel only, and a log is kept of all key transfers.

The Forensic Toxicology Section is located adjacent to the Forensic Chemistry Section, but has effective separation from it. The two sections are separated by a door which is closed when not in use.

Any controlled substances (in powder form) present in the section are kept in a locked drawer in the laboratory area (room 327). Only Forensic Toxicologists have a key to this drawer. Controlled substances in solution do not require secure storage conditions.

If environmental conditions are such that the validity or reliability of analytical results could be jeopardized, testing will be stopped until those conditions can be remediated.

The Forensic Toxicology Section complies with the lab-wide Health and Safety policy as detailed in the *ASCL Health and Safety Manual* (ASCL-DOC-08).

## **5.4 TEST METHODS AND METHOD VALIDATION**

### **5.4.1 Validations**

The Forensic Toxicology Section complies with the lab-wide policy regarding test methods and method validation.

### **5.4.2 Case Notes**

The Forensic Toxicology Section complies with the lab-wide policy regarding case notes.

### **5.4.3 Testing Requirements**

Standard analytical procedures are important in ensuring quality. Standardized test methods help to ensure that the analysis of each case is done in a manner consistent with scientific principles and the needs of the case. Any significant deviation from these test methods must be documented in the case file.

#### **5.4.3.1 Case Priority Policy**

Cases undergo testing in chronological order. Exceptions to this guideline may be made in response to:

- Properly documented Medical Examiner request for stat blood alcohol and/or carboxyhemoglobin (COHb) levels
- Requirements of the Office of the Medical Examiner (e.g. for NAME accreditation)
- Priority/rush requests
- Convenience of analysis (e.g. analyzing samples in batches for reasons of economy of scale)

Stat priority cases are assigned to any available analyst.

#### **5.4.3.2 Testing Guidelines**

The course of analysis is determined by an evaluation of the purpose of the submission, the facts of the case, and the constraints imposed by external factors (e.g. specimen amount, method limitations).

The goal of the Forensic Toxicology Section is to answer the purpose of the submission using the most appropriate assay(s), the least specimen, and the most efficiency.

If the specimen amount is insufficient to perform all of the analyses requested, the analyst attempts to prioritize the requests for analysis based upon the information obtained from the submission sheet. If there is insufficient information available to prioritize the requests then it is advisable to contact the submitting agency for guidance.

It is acceptable to analyze a smaller-than-normal sample amount if necessary, but a disclaimer accompanies any negative findings indicating that insufficient sample was available for normal testing. This disclaimer is not required if at least one normal aliquot of the specimen has been analyzed for each type of analysis reported.

The normal amount of specimen requested for various assays are:

Alcohol	5-10 mL blood, urine, or vitreous humour
GC-MS drug screening (qualitative only)	10-15 mL blood, urine, or vitreous humour
LC-MS drug screening (qualitative only)	5 mL blood or urine
Quantitation (each drug)	10 mL blood
Carbon monoxide	5 mL blood
Urine THC	5 mL urine
Opiates	10 mL blood
Urine immunoassay screening	5 mL urine
Blood immunoassay screening	5 mL blood

Sample containers containing a preservative (e.g. a gray-stoppered tube) should be used whenever possible and appropriate.

Other specimen types may be appropriate depending on the circumstances of the case.

#### 5.4.3.3 Initial Screening

An initial screening is routinely performed on cases after accession. This screening normally consists of a blood alcohol, LC-MS drug screen, or immunoassay test (as appropriate).

##### 5.4.3.3.1 Impairment Cases

The normal progression of analysis for a driving under the influence/driving while intoxicated (DUI/DWI) case is as follows:

1. Initial screening
  - i. Blood alcohol analysis (if appropriate)
  - ii. Immunoassay screening (if appropriate)
  - iii. LC-MS drug screening (if appropriate)
2. Acid/base extraction (if appropriate)
3. Generation of the Report of Laboratory Analysis

DUI/DWI cases are generally submitted to determine a cause for the impairment of an individual. In DUI/DWI cases where both alcohol and drug screens are requested, the blood alcohol analysis should be performed first. If the subject is above the applicable per se ethanol value, then no further analysis is required unless the case is associated with a Drug Recognition Expert (DRE) conclusion. In these cases an immunoassay or qualitative drug screen is performed, if the sample size permits. Blood is the preferred specimen, if available in sufficient quantity. The submission sheet should reflect that the law enforcement officer has performed a DRE evaluation and the class of intoxicant should be indicated.

Per se ethanol values vary. At or above these values, the subject is considered legally intoxicated, and further analysis is unnecessary to demonstrate intoxication.

<i>Driver</i>	<i>Per se limit (g% ethanol)</i>	<i>Statute</i>
Under 21 years-of-age	0.02	A.C.A. § 5-65-303
Commercial drivers or aircraft operators	0.04	A.C.A. § 27-23-114
Other drivers	0.08	A.C.A. § 5-65-203

Urine alcohol results are not reported unless the urine was sampled according to guidelines promulgated by the Arkansas Department of Health Office of Alcohol Testing (i.e., an initial voiding of the bladder, a thirty minute waiting period, and a second voiding of the bladder for urine collection). When it is not known if the urine was sampled properly, urine volatiles testing may be performed and reported qualitatively. This allows for the generation of a timely supplemental result in case it is later learned that the urine was sampled correctly.

If urine is available, a urine immunoassay screen may be performed. If only blood is available, an ELISA immunoassay or LC-MS screen should be performed (if the alcohol level is not sufficient to discontinue analysis).

In cases where the blood alcohol results and immunoassay screen are negative but impairment was indicated by the officer, a qualitative base screen or LC-MS drug screen is performed, as appropriate. Blood is the preferred specimen, if available in sufficient quantity. Efforts should be made to keep one milliliter of specimen in reserve, if possible, for further testing

Additional testing may be required in some cases. The course of additional testing depends on the details of the case. Fatality motor vehicle accidents require qualitative drug testing.

#### **5.4.3.4 Other Cases**

The course of analysis for other law enforcement cases is dependent upon the needs of each individual case. A course of analysis is determined based upon the request(s) of the law enforcement agency, our capabilities, and the needs of the case.

Aircraft crashes are under the jurisdiction of the FAA and/or NTSB and no toxicological samples from these cases are normally tested.

#### **5.4.3.5 Medical Examiner Cases**

The progression of analysis for medical examiner and coroner cases is as follows:

1. Stat alcohol and/or COHb analysis (if requested)
2. Initial screening
  - i. Immunoassay screening (if requested) Blood alcohol (if requested)
  - ii. COHb analysis (if requested)
3. Blood drug screening (acid and base fractions, if requested)
4. LC-MS drug screening (if requested)
5. Further testing (if requested)
  - i. Confirmation (if requested)
  - ii. Quantitation (if requested)
6. Generation of the Report of Laboratory Analysis

In many cases less analysis is necessary, and in these cases testing is limited to that requested by the medical examiner's or coroner's office.

Some pathologists request that more specimen types be analyzed on all cases with a positive blood ethanol. If requested, urine, bile, vitreous, and gastric contents will be

analyzed for ethanol.

Blood acid and base screens are run on the GC-MS. Efforts should be made to keep one milliliter of specimen in reserve, if possible, for further testing.

Certain ubiquitous drugs such as caffeine and nicotine are not reported or quantitated unless present in uncharacteristically large amounts. Lidocaine and atropine are generally not quantitated, but are reported.

Other testing may be required based on the needs of each case.

When a specific drug is requested for identification or quantitation by the pathologist, this should be addressed in the case file and the final report. An extracted-ion chromatogram will show the presence or absence of the drug in question.

#### **5.4.3.6 Acceptable Work Product**

##### **5.4.3.6.1 General Requirements**

The following sections define what makes up an acceptable work product. If one or more of these criteria cannot be met, the results from that assay may not be reported without the written approval of the Chief Forensic Toxicologist or their designee.

All dilutions of certified reference materials will be made using measured volumetric amounts.

When assays are performed by an analyst other than the one signing the report, the analyst doing the assay will initial all results generated. The analyst who signs the report will also need to indicate by initialing that they have reviewed this data. This may be recorded on the *Results Worksheet* (TOX-FORM-03) for results appearing on that worksheet, or by initialing each page of work performed by another analyst. In either case, the initials indicate that the analyst who signs the report agrees with the analytical results for all analyses. Analysts in the process of training who assist with testing will initial each page of those results, with their initials in parentheses to indicate that they assisted with the testing.

Any urine screens are qualitative only and any positive results are reported "present". Negative results are reported as "not detected".

Exceptions to some of these guidelines may be approved on a case-by-case basis by the section chief and/or quality manager. Written approval of the exception including a justification of the variance will appear in the case file. A log of method/procedure deviations will be kept by the Chief Forensic Toxicologist.

##### **5.4.3.6.2 Controls**

Positive and negative controls are analyzed as specified in each test method. If the measured values of a control differs more than the accepted amount for a quantitative assay, further investigation to determine the source of the discrepancy and appropriate action to correct it is warranted. This normally requires the extraction and analysis of a new control. This control may be from the same source to help determine if the problem

was in the extraction, or from a third source to help determine if the issue is with the control sample. If it is demonstrated that the curve is in error then a new calibration curve must be constructed. If it is demonstrated that the error is confined to the original control sample(s) then the cases may be quantitated against the curve. If a problem in the extraction is demonstrated, then re-extraction of the samples is necessary.

If a positive or negative control does not behave in the expected manner in a qualitative assay, another control is reanalyzed using the same method. This control may be from the same source to help determine if the problem was in the preparation, or from a third source to help determine if the issue is with the control sample.

Certified reference materials are used whenever possible. If no certified reference materials are available, then an uncertified primary reference material (such as a bulk powder or liquid from a chemical supplier) may be used, providing its quality has been verified. If no uncertified primary reference material is available, then tablets or capsules of stated content may be used.

All dilutions of certified reference materials will be made using measured volumetric amounts.

The amount of internal standard added to a standard or control should optimally be within an order of magnitude of the amount of analyte in that standard or control.

In a quantitative assay, a control sample will be run if drugs are present in quantities that fall on the appropriate analytical curve.

#### **5.4.3.6.3 Calibration Curves**

A calibration curve must be made of at least three points of varying concentration designed to encompass the concentration range of interest. Note that the specimen sample aliquot size and dilution factor may be varied in order to bring the measured concentration into the range of the calibration curve.

The samples used to generate the calibration curve must be extracted or otherwise prepared in the same manner as case specimens, as far as is possible and appropriate.

The standard number or lot number of each control used to generate the calibration curve (including the internal standard) will be recorded. The location and/or identity of the original data file used to generate the calibration curve must be recorded, if known. A curve evaluation worksheet is provided (TOX-FORM-09) which may be used to record this information.

Calibration curves are generated using a least-square or other well-accepted curve fitting algorithm (e.g., quadratic). The origin will not be used as a data point. The calibration curve will not be forced through the origin. A weighting factor (e.g.  $1/x$  or  $1/x^2$ ) may be used if it is demonstrated that this better fits the data. Non-linear or weighted curve fitting may require more calibration points to fully characterize than an unweighted linear calibration. An analysis of residuals may be helpful in this characterization.

The correlation coefficient ( $r$ ) of the calibration curve must exceed 0.990 and the calculated value of each calibrator must be within 20% of its target value, with the exception of the

lowest calibrator, which may vary up to 30% from its target value (as may a control made at this concentration).

If the correlation coefficient is less than 0.990 then the analyst should look for "outliers", where the calibrator is uncharacteristically off of the curve. The integration of this point (both analyte and internal standard) should be checked to see if it is integrated differently from the other standards. If the integrated peak is integrated in a different manner than the other peaks then this integration may be manually corrected or the integration parameters may be changed to make the integration more consistent between specimens. If the integration parameters are changed, then all points must be re-integrated and a new curve constructed. If the integration is consistent with the integration of the other calibrators and the outlier is still significantly off of an otherwise linear curve, then this point may be discarded.

If the measured value of a calibrator differs too much from the known value of that point, then the integration should be checked as above. If the integration is consistent with the integration of the other calibrators, then this point may be discarded.

Only one point should be discarded for these reasons. More than one outlier may indicate that the curve is not valid and should not be used to generate quantitative results.

If the lowest point(s) on the curve do not have an adequate response to meet quality control criteria, then these point(s) may be discarded. The detection limit of the calibration curve is then raised to the lowest point that meets the quality control criteria.

After the generation of an acceptable calibration curve, all control samples are quantitated against the curve. The measured value of the control samples must not be more than 20% from their known value, using the formula:

$$\text{Percent difference} = \left( \frac{\text{measured value} - \text{known value}}{\text{known value}} \right) \times 100$$

If a calibration curve does not meet these criteria of acceptability, then this calibration curve is invalid and may not be used to generate quantitative results. The analysis may, however, be used to generate qualitative results—if the appropriate quality control requirements are met.

Ion ratios (Q1/Q) of the calibrators may change within the calibration curve in an ascending or descending manner due to low responses of the ions. Control and casework ion ratios may be set individually to the closest calibrator concentration if needed.

#### 5.4.3.6.4 Notes

Standard abbreviations will be used for common specimen types (see the list of standard abbreviations in § 3 of this manual). Other abbreviations may be used to differentiate types not listed, to accommodate multiple specimens of the same type, or to differentiate between different subjects in the same case. The abbreviation listed on the accession sheet and associated uniquely with the specimen identifier must appear on each page of analytical data generated by the analysis of that specimen in order to correlate the analytical data to the correct specimen. If specimens are combined for analysis, then a new

abbreviation is made and a description of the composition of this new specimen must appear in the case record.

For homogenates and other dilutions, the dilution factor as well as a short description of the preparation (including the amount of specimen and diluent used) must be included in the case notes.

Batch worksheets are used to document the traceability of certified reference materials and measurement equipment. Balances and micropipettes used for measurements which can have a significant effect on a reported result will be identified on the batch worksheet or the results worksheet. Certified reference materials used in an assay will be identified on the batch worksheet or the results worksheet.

Batch worksheets are also used to record the evaluation of control results, if those controls are not otherwise contained in the case file. This evaluation is performed by a second qualified analyst.

Batch worksheets, and the control data associated with them, are stored in the LIMS in case files dedicated to this purpose.

#### **5.4.3.6.5 Additional Aliquots**

If a quantitative result is possibly elevated, then the initial quantitative result should be confirmed whenever possible by a second quantitation of the same specimen. "Possibly elevated" is defined as a level which is consistent with a concentration associated in the literature with a toxic or lethal level, or is inconsistent with a concentration associated in the literature with a therapeutic level, or a case where there is no information concerning these levels.

#### **5.4.3.6.6 Additional Assays**

The presence of drugs in a specimen should be confirmed, if possible, with a second analytical technique based on a different principle. For example, the presence of methamphetamine in a base screen could be confirmed by a positive immunoassay result for the amphetamines class. The presence of meaningful drugs in a specimen should be confirmed, if possible, with a second specimen or a second aliquot of the same specimen. This helps rule out contamination during extraction or transitory instrumental contamination.

#### **5.4.3.6.7 Contamination Countermeasures**

The prevention of contamination is of primary importance in a toxicology laboratory. There are many things that are done to both prevent and detect contamination, among them:

- Use of disposable glassware and other consumables whenever possible
- Analysis of duplicate samples
- Looking for common results in a batch
- Looking for the absence of appropriate levels of metabolites
- Washing items from the Forensic Chemistry and Forensic Toxicology Sections separately
- Solvent-rinsing of any cleaned, reused glassware

### 5.4.3.7 Method-Specific Requirements

#### 5.4.3.7.1 Gas Chromatography (GC)

In methods used to detect and identify an analyte, the signal-to-noise (S:N) ratio for a peak must be at least 10:1. The S:N ratio for a blank must not exceed 3:1 within a retention time window of  $\pm 2\%$  around the peak of interest.

In methods used to quantitate an analyte that has already been identified using a different method, the signal-to-noise (S:N) ratio for a peak must be at least 10:1. The S:N ratio for a blank must be less than 3:1, or less than 2% of the area of the peak for which it is the blank, within a retention time window of  $\pm 2\%$  around the peak of interest.

The retention time of an analyte may not differ more than  $\pm 2\%$  from the retention time of its control. The retention time of a symmetric peak is judged by the retention time at its apex. The retention time of an asymmetric peak may alternately be judged by the retention time of the beginning of the peak. The retention time of the control must be evaluated in the same manner as the analyte.

If a column is clipped or a new column is installed and this affects the retention time of an analyte, the retention time of that analyte may be changed without regeneration of the method if a known standard of that analyte is run to determine the new retention time. Alternately, the flow and or pressure may be altered to bring the retention time(s) back to their expected value(s).

Columns of different phases, phase ratios, and length may be substituted for the listed columns in gas chromatographic methods providing that positive and negative controls are run and perform adequately.

Internal standards may be changed if needed to help with co-eluting peaks or other analytical difficulties.

Instrumental conditions may be temporarily changed to assist in the analysis of a particular analyte, but the instrumental conditions will remain standardized for each method. Any changes must be documented in the case record.

#### 5.4.3.7.2 Gas Chromatography-Mass Spectrometry (GC-MS)

In a method using selected ion monitoring (SIM), the ratio of the qualifier ion(s) relative to the quantitation ion may not differ more than 20%, or the amount specified in the method. At least one SIM qualifier ion must be present.

In a scan mode or selected ion monitoring (SIM) quantitation, the ratio of the qualifier ion(s) to the quantitation ion is measured for each peak. This ratio for an unknown peak is compared to that of one or more positive controls to evaluate whether the analyte in question meets specifications. This ratio can differ by up to 20% relative to the expected ratio (or the amount specified in the method).

The expected ratio can vary with concentration, and can be determined in one of several ways:

- One positive control/calibrator can be selected as representative of the expected value

- If the values in the population of positive controls/calibrators vary too much to pick a single representative value, the ratio from the valid positive control/calibrator closest in concentration to the sample in question may be used
- The mean of all valid controls/calibrators can be used

If this ratio differs by more than 20% (or the amount specified in the method) relative to a measured value from a known standard, then the qualifiers fail. In this case the integration should be checked as above for each ion to determine whether the fault is with an inconsistent integration. If so, then the ion(s) may be manually reintegrated, the integration parameters may be changed, or a new standard may be chosen upon which to base the qualifier ratio calculation.

The signal-to-noise (S:N) ratio for a peak must be at least 10:1. The S:N ratio for a blank must not exceed 3:1 within a retention time window of  $\pm 2\%$  around the peak of interest. S:N ratios may be evaluated by using the total ion chromatogram, an extracted ion chromatogram using ions characteristic of the analyte in question, or the selected ion chromatogram. In a GC-MS SIM-mode method, the failure of qualifier ion ratios is sufficient to consider a negative control blank.

A scan-mode mass spectral identification must be based upon a match to a control, library, literature, or otherwise-known spectrum. All significant peaks (generally above 10% of the base peak) in the known spectrum should be in the unknown spectrum, or their absence must be explainable. All other major peaks must be explainable.

Deuterated compounds may always be used as an internal standard for their undeuterated version.

#### **5.4.3.7.3 Carboximetry**

By UV/Visible spectrometry, a matrix blank cannot contain more than 5% carboxyhemoglobin saturation. The positive control must be within the range reported by the manufacturer. If either control is out of range, it may be rerun.

Using Conway diffusion, the positive control must be clearly more positive than the negative control. The negative control must not have any metallic film.

#### **5.4.3.7.4 Urine Immunoassay**

Any instrumental exceptions must be investigated and corrected if possible. If the exception in that assay cannot be corrected, then the results for that assay and specimen cannot be reported.

#### **5.4.3.7.5 ELISA**

Absorbance must decrease with increasing concentration of analyte.

There is no minimum correlation coefficient of any analytical curve obtained due to the inherent nonlinearity of the method.

### **5.4.4 Measurements**

Measurements must be performed so as to minimize any errors.

#### 5.4.4.1 Micropipetting

When micropipetting liquids with a manual micropipette, two methods are acceptable:

##### Traditional method

1. Set and lock desired volume to be pipetted
2. Firmly attach the pipette tip
3. Press plunger to the first stop only
4. Holding the micropipette vertically ( $\pm 20^\circ$ ), immerse the pipette tip into the source liquid and slowly return the plunger to its starting position
5. Remove the pipette from the source liquid and place in its target container, placing the pipette tip against the side of the container
6. Slowly press the plunger past the first stop to the bottom of the piston stroke, waiting for the liquid to fully transfer
7. Remove the pipette from the target container and eject the pipette tip into an appropriate waste container

##### Reverse pipette method

1. Set and lock desired volume to be pipetted
2. Firmly attach the pipette tip
3. Press plunger past the first stop to the bottom of the piston stroke
4. Holding the micropipette vertically ( $\pm 20^\circ$ ), immerse the pipette tip into the source liquid and slowly return the plunger to its starting position
5. Remove the pipette from the source liquid and place in its target container, placing the pipette tip against the side of the container
6. Slowly press the plunger to the first stop only, waiting for the liquid to fully transfer
7. Remove the pipette from the target container and eject the pipette tip into an appropriate waste container

#### 5.4.4.2 Massing

All materials to be massed must be placed into a clean receptacle.

#### 5.4.4.3 Dilution

Dilution may be performed by using a volumetric flask, filling so as the meniscus coincides with the mark on the neck of the flask.

Dilution may be performed by adding measured volumes of liquid if (and only if) all measured volumes are of the same solvent. Measured volumes of different solvents may not be additive.

#### 5.4.4.4 Calculations

All calculations will be performed and documented in the following manner:

- All decimal places will be carried throughout the calculation

- Only the result will be adjusted to the proper number of significant figures
- The reported amount may have fewer significant figures than the calculated result, but not more
- When averaging: if the final digit is 5, then round away from zero (round positive numbers up, and negative numbers down)
- When a manually-calculated result is given, the numbers used to generate that result will be explicitly listed if any deviation from normal procedure occurs (e.g., a value is excluded when averaging)

## 5.4.5 Test Methods

Standard analytical procedures are important in ensuring quality. The following standard operating procedures help to ensure that the analysis of each case is done in a manner consistent with scientific principles and the needs of the case. Any significant deviation from the standard operating procedure must be documented in the case file.

### 5.4.5.1 Test Methods

#### 5.4.5.1.1 Indiko Plus Immunoassay Screen

##### Scope

The Indiko Plus is based upon the Enzyme Multiplied Immunoassay Technique (EMIT). This method is applicable to urine. The specimen size is determined by the number of analytes chosen for analysis.

##### Reagents

- Indiko reagent packs
- Deionized water

##### Controls

- Indiko controls
- Indiko calibrators

##### Equipment

- Micropipetter
- Reaction vessels
- Sample vials

##### Instrumentation

- Thermo Fisher Indiko Plus

##### Instrument Conditions

Instrument conditions are set by the manufacturer.

##### Procedure

1. Perform any daily, weekly or monthly maintenance required by the instrument operating manual
2. Run controls to ensure the instrument is functioning properly
3. File control results
4. Run samples to be analyzed in accordance with the manufacturer's instructions making sure that each sample is properly identified with its ASCL case number and specimen ID
5. Place results in appropriate case files

### **Quality Assurance, Interpretation, Precautions, and Notes**

A calibration curve for each assay is generated (at least) weekly before use. Positive controls (above and below the decision point), as well as a negative control (consisting of drug-free urine), are analyzed daily to ensure proper functioning of the instrument.

A control chart is generated (using the instrument software) to look for issues or trends in the performance of the controls, on a monthly basis.

The identity of each specimen must be verified by the analyst with a one-to-one comparison between the specimen labeling and the specimen location entered into the instrument.

The results of an immunoassay screen are reported as “positive” or “negative”, dependent upon a comparison of the response of the instrument to an internal calibration curve. Responses more positive than the decision point are considered “positive”. All reported immunoassays without further confirmation will include the disclaimer:

*Note: Screening of the specimen(s) submitted has yielded the following preliminary results. Should confirmatory or additional testing be required, you must contact this office within ninety (90) days of the issuance of this report. The specimen(s) will be destroyed after ninety (90) days.*

### **Preparation of Materials**

Materials are purchased fully prepared.

### 5.4.5.1.2 Ethanol Analysis

#### Scope

This method is designed to detect the presence of ethanol and other volatiles in blood, urine, vitreous, gastric, tissue homogenate, and other liquids by headspace gas chromatography using dual column analysis. Ethanol is identified by retention time.

This procedure is appropriate for blood, bile, urine, gastric, vitreous, other liquids, and homogenized tissue or clot samples. A sample size of 0.1 mL or 0.2 g of a 1:1 tissue homogenate is generally used.

#### Chemicals and Reagents

- 0.05% n-propyl alcohol v/v in deionized water
- Methanol
- Isopropanol
- Acetone
- Difluoroethane (if needed)
- Tetrafluoroethane (if needed)
- Toluene (if needed)

#### Controls

- Ethanol certified reference materials: 0.05 and 0.20 g%
- Calibration curve ethanol standards: 0.010, 0.020, 0.050, 0.100, 0.200, 0.300, 0.400 g%
- Calibration curve methanol, acetone, isopropanol standards: 0.010, 0.020, 0.050, 0.100, 0.200 and 0.400 g% (each)
- Methanol, acetone, and isopropanol control sample
- Difluoroethane, tetrafluoroethane, and toluene control samples

#### Equipment

- 20 mL sample vials designed to accommodate 20 mm crimp-on rubber septa
- Volumetric pipetors for the range of 100  $\mu$ L through 1000  $\mu$ L
- Crimper

#### Instrumentation

Gas chromatograph:	HP 6890 or equivalent
Headspace unit:	HP G1888 or equivalent
Column type:	Rtx-BAC1: 30 m, 0.32 mm ID, 1.8 $\mu$ m film thickness
Rtx-BAC2:	30 m, 0.32 mm ID, 1.2 $\mu$ m film thickness

#### Instrument conditions

Gas Chromatograph		Headspace Unit	
Column		Temperatures	
Carrier:	Constant flow	Oven temp (°C):	70
Flow (mL/min):	~8.0	Loop temp (°C):	115

<b>Inlet</b>	
Inlet temp (°C):	250
Inlet pressure (psi):	27.267
Mode:	Split
Split ratio:	5:1
<b>Detector</b>	
FID temp (°C):	250
Hydrogen flow (mL/min):	40
Air flow (mL/min):	450
Makeup to (mL/min):	45

Transfer line temp (°C):	120
<b>Times (min)</b>	
Vial equilibration:	3.0
Pressurization:	0.20
Loop fill:	0.05
Loop equilibration:	0.20
Injection:	0.25
GC cycle:	6.5
<b>Pressures (kPa)</b>	
Carrier gas	68
Vial	7

**Temperature Ramp**

Rate (C°/min)	Temperature (°C)	Hold Time (min)
	50	1
40	140	0.25

**Procedure**

1. Label sample vials appropriately for controls and the samples to be run
2. Pipette 1000 µL of 0.05% n-propyl alcohol into each vial
3. Pipette 100 µL of sample or control into the each previously labeled vials and cap each vial
4. Load vials into autosampler carousel, running controls to check agreement with the previously stored curve
5. Upon completion of the run, check for agreement between values and place the results in the proper case files

**Quality Assurance, Interpretation, Precautions, and Notes**

A calibration curve is stored as part of the instrument method. A suggested calibration curve consists of the following data points (grams analyte/100 mL sample (g%)):

Analyte	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7
Ethanol	0.010	0.020	0.050	0.100	0.200	0.300	0.400
Methanol	0.010	0.020	0.050	0.100	0.200	0.300	0.400
Acetone	0.010	0.020	0.050	0.100	0.200	0.300	0.400
Isopropanol	0.010	0.020	0.050	0.100	0.200	0.300	0.400

At least two positive control samples must be run in each batch. A control sample must be run for each analyte reported. Positive controls for ethanol will be run at 0.050 g% and 0.200 g%. Positive controls for methanol, acetone, and isopropanol will be run at 0.100 g%. Additional controls may be analyzed as needed. The measured values of all positive control samples must be within 10% of their known value or the range suggested by the manufacturer (if less strict) to report quantitative results for an analyte. Qualitative results may be reported based upon retention time alone.

If a control sample falls outside that range another control sample is prepared and the control samples are rerun. If the control sample still fails, then further investigation and appropriate action is required before case samples are run.

A negative control consisting of blood bank blood must be analyzed in every batch. Any positive result requires further investigation and appropriate action.

The performance of the controls will be evaluated by a second analyst, and a record of this evaluation will be recorded on a batch worksheet and maintained in the case record.

It is recommended that alcohols be run in two batches. The first batch contains all of the samples to be analyzed. The second batch, which is aliquotted separately, contains only those samples which require corroboration. Samples requiring corroboration include:

- Biological samples containing 0.01 g% or more of a volatile component
  - Biological samples containing less than 0.01 g% of ethanol, methanol, isopropanol, or acetone may be reported as “<0.01 g%” without further corroboration
- Non-biological samples containing any amount of ethanol
- Samples which are positive for a qualitative analyte (e.g., toluene, difluoroethane)

Other volatiles (including difluoroethane, tetrafluoroethane, and toluene) can also be determined by this procedure using the proper positive and negative controls and run times.

Decomposed specimens may yield greater variation between duplicate runs than is expected from fresh specimens, and should be followed in the sequence by a blank to prevent carryover.

Positive alcohol results may be reported if both aliquots of the same specimen give results within 0.005 g% or 10% (whichever is greater) from the mean as calculated by the formula:

$$\textit{Percent difference} = \left( \frac{\textit{Result} - \textit{Mean}}{\textit{Mean}} \right) \times 100$$

If there are values outside of the acceptable range, the analysis is repeated in duplicate. If reanalysis is necessary, all original values are discarded and only the newly-acquired results are used in the calculation of reported results.

If methanol, acetone, or isopropanol are present then a control sample containing that compound must be run. Methanol, acetone, and isopropanol may then be reported if all aliquots of the same specimen give results within 0.005 g% or 10% (whichever is greater) from the mean as calculated by the formula:

$$\textit{Percent difference} = \left( \frac{\textit{Result} - \textit{Mean}}{\textit{Mean}} \right) \times 100$$

If there are values outside of the acceptable range, the analysis is repeated in duplicate. If reanalysis is necessary, all original values are discarded and only the newly-acquired results are used in the calculation of reported results. If methanol is present and the specimen was taken postmortem (and may have been from an embalmed source), a disclaimer such as the following must be added:

*Note: Methanol is a common component of embalming fluid.*

A positive result must show a peak in every run on both columns.

Each quantitative result is reported as the mean of the two experimental results, rounded at the third decimal place using the rounding rule in § 5.4.4.4. If this mean does not lie in the calibration range, then the result is reported as “greater than” or “less than” the appropriate calibrator.

Each qualitative result is reported as “present” or “not detected”.

Please see § 5.4.6 (Estimation of Uncertainty of Measurement) for guidelines on reporting those values.

Beverages and/or unknown liquids may undergo quantitative volatiles testing, with these additional requirements:

1. The case specimen is tested at a dilution of 1:250, prepared by adding 40 µL of sample to a class A 10 mL volumetric flask and making up to the line with distilled water.
  - a. The obtained result (in g%) must be multiplied by a factor of 250 to account for the dilution of the original specimen.
2. An additional negative control consisting of 100 µL of the water used to dilute the case specimen is required, to demonstrate that no analyte was added to the sample via the dilution process.
3. The result is reported in units of % w/w, obtained by using the conversion:  
 $[\% \text{ w/w}] = [\text{g}\%] / 0.789$
4. The measurement of uncertainty calculation will take place after the conversion of the result from units of g% to % w/w.

### **Preparation of Materials**

#### *Calibration curve reference materials:*

These standards are purchased in certified concentrations, used as supplied, except:

- The 0.010 g% level is prepared by aliquotting 20 µL of the 0.0500 g% standard and 80 µL of deionized water into the headspace vial in lieu of 100 µL of standard.
- The 0.020 g% level is prepared by aliquotting 40 µL of the 0.0500 g% standard and 60 µL of deionized water into the headspace vial in lieu of 100 µL of standard.
- The 0.200 g% level is prepared by aliquotting 50 µL of the 0.400 g% standard and 50 µL of deionized water into the headspace vial in lieu of 100 µL of standard.

- The 0.300 g% level is prepared by aliquotting 75  $\mu\text{L}$  of the 0.400 g% standard and 25  $\mu\text{L}$  of deionized water into the headspace vial in lieu of 100  $\mu\text{L}$  of standard.

*Methanol, acetone, isopropanol control sample (0.100 g%):*

1. Add 127  $\mu\text{L}$  of methanol, 128  $\mu\text{L}$  of isopropanol, and 127  $\mu\text{L}$  acetone to a Class A 100 mL volumetric flask. Make up to 100 mL with deionized water.
2. 0.05% n-propyl alcohol v/v in deionized water:
3. Add 1 mL n-propyl alcohol to 2 L deionized water and mix well.

**5.4.5.1.3 Base Screen****Scope**

This method is designed to detect the presence of basic drugs by gas chromatography-mass spectrometry. The drugs are extracted from their biological matrix by liquid-liquid extraction and identified by their mass spectrum and retention time (if known).

The instrument method is retention-time locked to methaqualone to allow for long-term stability of retention times and the use of a screener library.

This method is applicable to urine, blood, serum, bile, tissue homogenates, and gastric contents. A 5 mL or 5 g sample is generally used for screening, and other sample amounts may be used for quantitation.

**Chemicals and Reagents**

- Concentrated ammonium hydroxide
- Concentrated hydrochloric acid
- 1N Hydrochloric acid
- n-Butyl chloride (chromatographic grade)
- Hexane (chromatographic grade)
- Methanol (ACS grade)
- Chloroform (chromatographic grade)
- Water (reverse osmosis or Millipore)

**Controls**

- Methaqualone stock: certified 1.0 mg/mL
- Methaqualone working solution (0.10 mg/mL)
- Base test mix (1.0 µg/mL each of amphetamine, phentermine, methamphetamine, diphenhydramine, amitriptyline, nortriptyline, oxycodone, and alprazolam)

**Equipment**

- 15 mL screw cap centrifuge tubes
- Pipets and pipettors
- Tube rotators
- Centrifuge
- Aspirator
- Autosampler vials with inserts and caps with rubber septa
- Crimper

**Instrumentation**

Gas chromatograph:	Agilent 6890 or equiv	Column type:	ZB-5 or equiv
Mass spectrometer:	Agilent 5973 or equiv	Length (m):	15
Autosampler:	Agilent 7683 or equiv	ID (mm):	0.25
		Film thickness (µm):	0.25

**Instrument conditions**

<b>Inlet</b>	
Mode:	Pulsed splitless
Inlet temp (°C):	250
Pressure (psi):	4.81 (variable)
Pulse pressure (psi):	20.0
Pulse time (min):	0.50
Purge flow (mL/min):	20.7
Purge time (min):	2.00
Total flow (mL/min):	24.9 (variable)
Gas saver:	On
Saver flow (mL/min):	20.0
Saver time (min):	2.00
Gas type:	Helium

<b>Column</b>	
Mode:	Constant pressure
Pressure (psi):	4.81
Initial flow (mL/min):	1.5
Avg. velocity (cm/sec):	64
<b>Detector</b>	
Detector:	MSD
Transfer line temp (°C):	280
Quad temp (°C):	150
Source temp (°C):	250
Mass range (amu):	35-550, scan mode
Threshold:	150
Number of samples:	2
Solvent delay (min):	2.45 (variable)

**Temperature Ramp**

Rate (°C/min)	Temperature (°C)	Time (min)
	50	0.5
30	200	0
20	330	1.5

**Procedure**

1. Label the proper number of 15 mL extraction tubes for the samples and controls to be extracted.
2. Pipette 5 mL of body fluid, control, or 5 g 1:1 tissue homogenate (w/w in normal saline) into the labeled tubes.
3. Adjust the pH of each specimen to approximately 9 by adding approximately 0.2 mL of concentrated ammonium hydroxide.
4. Add 50 µL of 0.1 mg/mL methaqualone to each tube.
5. Add 50 µL of base test mix to the positive control
6. Add approximately 10 mL of n-butyl chloride to each tube, cap tightly and place tubes on rotator for approximately 15 minutes, or until extracted.
7. Remove tubes from rotator, place in centrifuge for approximately 5 minutes or until separated.
8. Pipette the top layer (n-butyl chloride) from each tube into a clean, labeled 15 mL tube.
9. Add approximately 5 mL of 1N hydrochloric acid to each tube, cap tightly and repeat the above rotation and centrifugation steps.
10. Carefully aspirate and discard the top layer, retaining the lower HCl layer.
11. Add 1 mL concentrated ammonium hydroxide to each tube.
12. Add approximately 100 µL of chloroform to each vial.
13. Cap tightly and repeat the rotation and centrifugation steps.

14. Carefully transfer the bottom (chloroform) layer from each extract to a properly labeled autosampler vial and crimp on the septum cap
15. Place the vials into the autosampler tray and set up a sequence in the data system ensuring that a blank is injected before each sample or control run to detect possible carryover from one specimen to the next
16. Run the sequence, then compare retention times and mass spectra of peaks within the chromatograms to known retention times and mass spectra, if known

**Quality Assurance, Interpretation, Precautions, and Notes**

A positive control (the base test mix) and a negative control (a matrix blank) are extracted and analyzed with each batch of samples.

Any significant chromatographic problems will be investigated and appropriate action taken.

SIM ions may be added to the method so long as the base test mix still performs adequately.

Efforts should be made to keep one milliliter of specimen in reserve, if possible, for further testing.

Morphine, cannabinoids, clonazepam, lorazepam, and benzoylecgonine will not generally be detected with this screening procedure. Screening for these compounds can be accomplished by additional SIM methods.

Care should be taken that only fresh concentrated ammonium hydroxide is used to ensure consistent extraction efficiencies.

The specimens may also be extracted by inversion in lieu of using the tube extractor. The samples must be extracted in a manner equivalent to rotation.

Pressures and flows may be changed as needed to ensure the proper functioning of the method.

The performance of the controls will be evaluated by a second analyst, and a record of this evaluation will be recorded on a batch worksheet and maintained in the case record.

**Preparation of Materials***1N Hydrochloric acid:*

To a 1 L volumetric, add approximately 500 mL of deionized water. Slowly add 83.0 mL concentrated hydrochloric acid and vortex gently. Dilute to the mark with deionized water and mix well.

*Methaqualone working solution (0.10 mg/mL):*

Dilute 1.0 mL stock to 10.0 mL with A.C.S. grade methanol

*Base test mix:*

Aliquot 1 mL each of 1 mg/mL certified solutions of amphetamine, phentermine, methamphetamine, diphenhydramine, amitriptyline, nortriptyline, oxycodone, and alprazolam into a class A 10 mL volumetric flask. Make up to 10 mL with methanol.

#### 5.4.5.1.4 Acid Screen

##### Scope

This method is designed to detect acidic drugs by gas chromatography or gas chromatography-mass spectrometry. The drugs are extracted from their biological matrix by liquid-liquid extraction and identified by their mass spectrum and retention time (if known).

This method is applicable to urine, blood, serum, bile, tissue homogenates, and gastric contents. A 5 mL or 5 g sample is generally used unless circumstances warrant the use of a different sample size (e.g. very high or very low suspected drug levels).

##### Chemicals and Reagents

- Methanol (ACS grade)
- Potassium phosphate monobasic (A.C.S. certified)
- Ethyl ether (chromatographic grade)
- Toluene (chromatographic grade)
- Water (reverse osmosis or Millipore)
- Absolute ethanol
- Hexane (chromatographic grade)
- Compressed inert gas (generally nitrogen or helium)
- Ether/toluene extraction solvent
- 80% ethanol extraction solvent

##### Controls

- Barbitol stock solution (20 mg/mL)
- Barbitol working solution (0.2 mg/mL)
- Acid test mix: 0.2 mg/mL butalbital, carisoprodol, and phenytoin

##### Equipment

- 15 mL screw cap centrifuge tubes
- Pipets and pipettors
- Tube rotator
- Heating block/evaporation apparatus
- Centrifuge
- 13x100 mm culture tubes
- Autosampler vials with inserts and caps with rubber septa
- Crimper
- Nitrogen distribution device
- Vortex mixer

##### Instrumentation

Gas chromatograph:	Agilent 6890 or equiv
Mass spectrometer:	Agilent 5973 or equiv
Autosampler:	Agilent 7683 or equiv

Column type:	ZB-5 or equiv
Length (m):	15
ID (mm):	0.25
Film thickness (µm):	0.25

**Instrument conditions**

<b>Inlet</b>	
Mode:	Pulsed splitless
Inlet temp (°C):	250
Pressure (psi):	4.81 (variable)
Pulse pressure (psi):	20.0
Pulse time (min):	0.50
Purge flow (mL/min):	20.7
Purge time (min):	2.00
Total flow (mL/min):	24.9 (variable)
Gas saver:	On
Saver flow (mL/min):	20.0
Saver time (min):	2.00
Gas type:	Helium

<b>Column</b>	
Mode:	Constant pressure
Pressure (psi):	4.81
Initial flow (mL/min):	1.5
Avg. velocity (cm/sec):	64
<b>Detector</b>	
Detector:	MSD
Transfer line temp (°C):	280
Quad temp (°C):	150
Source temp (°C):	250
Mass range (amu):	35-550, scan mode
Threshold:	150
Number of samples:	2
Solvent delay (min):	2.45 (variable)

**Temperature Ramp**

Rate (C°/min)	Temperature (°C)	Time (min)
	50	0.5
30	200	0
20	330	1.5

**Procedure**

1. Label the proper number of 15 mL extraction tubes for the samples and controls to be extracted
2. Pipette 5 mL of body fluid, control, blank, or 5 g 1:1 tissue homogenate (w/w in normal saline) into the labeled tubes
3. Add approximately 0.2 g potassium phosphate monobasic to each tube
4. Add 100 µL of the barbital internal standard solution to each tube
5. Add 100 µL of the acid test mix to the positive control
6. Add approximately 5 mL of ether/toluene extraction solvent to each tube, cap tightly and place tubes on rotator for approximately 15 minutes or until extracted
7. Remove tubes from rotator, place in centrifuge for approximately 5 minutes or until separated
8. Carefully transfer the top layer (ether/toluene) into properly labeled and solvent-rinsed extraction tubes
9. Place tubes in heating block at approximately 70°C. and evaporate to dryness with nitrogen

10. Add approximately 1 mL of hexane to each tube and vortex
11. Add approximately 100  $\mu$ L of 80% ethanol to each tube and vortex or stopper the tubes and thoroughly mix by repeated inversions
12. Centrifuge for approximately 5 minutes or until separated
13. Carefully transfer the bottom layer of each tube into the insert of a properly labeled autosampler vial and cap the vial
14. Place vials in autosampler tray and set up a sequence ensuring that a blank is injected before each sample or control run to detect possible carryover from one specimen to the next
15. Run the sequence, then compare retention times and mass spectra of peaks within the chromatograms to known retention times and mass spectra, if known

#### **Quality Assurance, Interpretation, Precautions, and Notes**

A positive control (the acid test mix) and a negative control (a matrix blank) are extracted and analyzed with each batch of samples.

Any significant chromatographic problems will be investigated and appropriate action taken.

Efforts should be made to keep one milliliter of specimen in reserve, if possible, for further testing.

The specimens may also be extracted by inversion in lieu of using the tube extractor. The samples must be extracted in a manner equivalent to rotation.

Instrument pressures and flows may be changed as needed to ensure the proper functioning of the method.

The performance of the controls will be evaluated by a second analyst, and a record of this evaluation will be recorded on a batch worksheet and maintained in the case record.

#### **Preparation of Materials**

*Barbital stock solution (20 mg/mL):*

Add 200 mg barbital to a Class A 10 mL volumetric flask and make up to 10 mL with A.C.S. grade methanol

*Barbital working solution (0.2 mg/mL):*

1:100 dilution of 20 mg/mL stock solution in deionized water

*Ether/toluene extraction solvent:*

1:1 mixture of diethyl ether and toluene

*80% ethanol extraction solvent:*

80 mL ethanol mixed with 20 mL deionized water

*Acid test mix:*

Aliquot 2 mL each of 1 mg/mL certified solutions of butalbital, carisoprodol, and phenytoin into a class A 10 mL volumetric flask. Make up to 10 mL with methanol.

#### 5.4.5.1.5 GC-MS Quantitation

##### Scope

This method is an adjunct to the qualitative base and acid extractions listed above, designed to add quantitation to the qualitative identification. The analytes are extracted by the appropriate liquid-liquid extraction with concomitantly-extracted calibrators and controls. Matrix matching will be utilized when possible. Urine specimens will not be quantitated, due to the difficulty in determining the relevance of those quantitative results. The needs of the case determine which specimens are quantitated.

The general requirements for quantitation by this method are set out below. There is some necessary variation in the assay specifications due to the differing behaviors and requirements of each targeted analyte. The expected behavior for each analyte can be found in the appropriate validation document.

##### Instrumentation

Gas chromatograph:	Agilent 7890 or equiv	Column type:	ZB-5 or equiv
Mass spectrometer:	Agilent 5975 or equiv	Length (m):	15
Autosampler:	Agilent 7683 or equiv	ID (mm):	0.25
		Film thickness (µm):	0.25

##### Instrument conditions

Inlet		Column	
Mode:	Pulsed splitless	Mode:	Constant pressure
Inlet temp (°C):	250	Pressure (psi):	7.65
Pressure (psi):	7.65 (variable)	Initial flow (mL/min):	2.0
Pulse pressure (psi):	20.0	Avg. velocity (cm/sec):	73
Pulse time (min):	0.50		
Purge flow (mL/min):	20.7	<b>Detector</b>	
Purge time (min):	2.00	Detector:	MSD
Total flow (mL/min):	25.4 (variable)	Transfer line temp (°C):	280
Gas saver:	On	Quad temp (°C):	150
Saver flow (mL/min):	20.0	Source temp (°C):	250
Saver time (min):	2.00	Mass range (amu):	35-550, scan mode
Gas type:	Helium	Threshold:	150
		Number of samples:	2
		Solvent delay (min):	2.45 (variable)

##### Temperature Ramp

Rate (C°/min)	Temperature (°C)	Time (min)
	50	0.5
30	350	1.5

##### Procedure

1. Prepare, for each targeted analyte:

- a. Up to six calibrators, prepared from a certified reference material (CRM),
  - b. Two positive controls, from a separate CRM than the calibrators,
  - c. One negative matrix control, and
2. Prepare all case specimens.
  3. Extract each item using either the acid/neutral or base extraction procedure.
  4. Place vials in autosampler tray and set up a sequence ensuring that a blank is injected before each sample or control, to detect possible carryover from one specimen to the next.
  5. Run the sequence using the instrumental parameters listed above.
  6. Perform data analysis.

### **Quality Assurance, Interpretation, Precautions, and Notes**

#### *Calibrators:*

Up to six calibrators will be analyzed to set the linear range of the method. These calibrators will be prepared in the appropriate matrix using CRMs, whenever available. The concentrations of these calibrators will vary by analyte, with the expected working range listed in the validation document for each analyte. Calibrators outside of the validated working range may not be included in the assay. The use of calibrated analytical balances, pipettes, and class A volumetric glassware, as appropriate, is required for calibrator preparation.

The calibration curve must meet the requirements outlined in §5.4.3.6.3, *Calibration Curves*.

#### *Controls:*

The test mixes listed in the qualitative methods are replaced in this method by positive controls of the targeted analyte(s). The concentration of the positive controls will vary by analyte, depending upon the expected working range of the assay for that analyte. At least two positive control concentrations will be analyzed, designed to evaluate the lower half and the upper half of the working range. The CRM used to prepare the positive control must be from a different source than the CRM used to prepare the calibrators. Each positive control must fall within 20% of its target value (30% for the concentration of the lowest calibrator) and be within the working range of the calibration curve.

A negative control will be extracted—containing only internal standard—to demonstrate the absence of any contaminant which would result in a false positive response. The targeted analyte must not be detected (reportable) in the negative control.

#### *Specimens:*

Two aliquots of each case specimen should be run, if sample amount permits. The quantitative results of any two aliquots of the same specimen may not deviate more than 20% from their mean.

#### *Other notes and requirements:*

The qualitative presence of each analyte is determined by an evaluation of the full-scan EI mass spectrum—rather than using ion ratios, as is the case with SIM analysis. Nonetheless, ion ratios are a useful tool in detecting coelution by interfering compounds.

The response of each analyte is measured using a quantitation ion. The response of a second qualifier ion is also measured to determine an ion ratio (the qualifier ion response divided by the quantitation ion response). The qualifier ion ratio is set for the method in the same way as in a SIM analysis. To report a quantitative value, the ion ratio for a targeted analyte must be within 20% of the ion ratio set for the method. If the ion ratio is more than 20% from the ratio set for the method, then the analyte may only be reported qualitatively.

If there is a contribution to the quantitation or qualifier ions from a compound which coelutes with either the internal standard or the targeted analyte, alternate ions may be selected to avoid the contribution from this coeluting compound. These ions must be used throughout the affected quantitation batch.

If the amount of analyte present in an extract saturates (or is expected to saturate) the mass spectrometer detector, the final extract may be diluted in a larger-than-normal amount of solvent to prevent this effect—typically double the normal amount is used (i.e., 200  $\mu$ L of either chloroform or 80% ethanol, rather than 100  $\mu$ L).

Multiple analytes may be added to the same calibrators and controls. More than five analytes per vial may lead to solvent saturation issues, and is discouraged.

A 5 mL case aliquot is typically used, but this aliquot size may be altered as necessary to ensure that the obtained result is within the working range of the calibration curve.

Each quantitative value reported must be accompanied by an estimate of the uncertainty of measurement.

Instrument pressures and flows may be changed as needed to ensure the proper functioning of the method.

The performance of the calibrators and controls will be evaluated by a second analyst, and a record of this evaluation will be recorded on a batch worksheet and maintained in the case record.

#### 5.4.5.1.6 Urine Cannabinoid Confirmation

##### Scope

This method is designed to detect the presence of ( $\pm$ )-11-nor-9-Carboxy- $\Delta$ 9-THC by selected ion monitoring (SIM) gas chromatography-mass spectrometry. The ( $\pm$ )-11-nor-9-Carboxy- $\Delta$ 9-THC is extracted from its biological matrix by liquid-liquid extraction, derivatized, and detected by monitoring of the derivative ions.

This method is applicable to urine specimens. A 2 mL sample is generally used.

##### Chemicals and Reagents

- 60% KOH
- Concentrated acetic acid
- Extraction solvent (9:1 hexane:ethyl acetate)
- MSTFA
- Anhydrous ethyl acetate

##### Controls

- ( $\pm$ )-11-nor-9-Carboxy- $\Delta$ 9-THC certified reference material
- ( $\pm$ )-11-nor-9-Carboxy- $\Delta$ 9-THC-D3 certified reference material

##### Equipment

- 15 mL screw cap extraction tubes
- Pipets and pipettors
- Tube rotator
- Centrifuge
- Autosampler vials with inserts and crimp-on caps with rubber septa
- Crimper

##### Instrumentation

Gas chromatograph:	Agilent 6890 or equiv
Mass spectrometer:	Agilent 5973 or equiv
Autosampler:	Agilent 7673 or equiv

Column type:	DB-5MS or equiv
Length (m):	30
ID (mm):	0.20
Film thickness ( $\mu$ m):	0.33

##### Instrument conditions

Inlet	
Mode:	Splitless
Inlet temp ( $^{\circ}$ C):	250
Column head pressure (kPa):	125
Gas type:	Helium

Detector	
Detector:	MSD
Transfer line temp ( $^{\circ}$ C):	300
Resolution:	Low
Dwell per ion (ms):	100
Solvent delay (min):	8.9 (variable)

##### Temperature Ramp

Rate ( $^{\circ}$ C/min)	Temperature ( $^{\circ}$ C)	Time (min)

	180	0
30	280	10
30	300	2

Ions monitored:	371, 473, 488, 374, 476, 491
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### Procedure

1. Pipet 2 mL of each specimen or blood bank blood into a 15 mL screw cap extraction tube
2. Add 50  $\mu$ L of 0.01 mg/mL ( $\pm$ )-11-nor-9-Carboxy- $\Delta$ 9-THC-D3 to each vial
3. Add 20  $\mu$ L and 50  $\mu$ L of 0.01 mg/mL ( $\pm$ )-11-nor-9-Carboxy- $\Delta$ 9-THC to the appropriate positive control samples
4. Add 100  $\mu$ L of 60% KOH
5. Vortex and let stand for approximately 20 minutes
6. Add 500  $\mu$ L of concentrated acetic acid and vortex
7. Add approximately 2 mL of the extraction solvent
8. Cap and extract on rotator for approximately 10 minutes or until extracted
9. Centrifuge until separated
10. Remove top solvent layer to a 15 mL screw cap extraction tube
11. Evaporate to dryness under nitrogen
12. Add 40  $\mu$ L of MSTFA
13. Cap and heat at approximately 70°C for approximately 20 minutes
14. Add 100  $\mu$ L of anhydrous ethyl acetate, vortex, and transfer to an autosampler vial
15. Place vials in autosampler tray and set up a sequence ensuring that a blank is injected before each sample or control run to detect possible carryover from one specimen to the next.
16. Run the sequence using a SIM method that monitors m/z 371, 374, 473, 476, 488, and 491.

### Quality Assurance, Interpretation, Precautions, and Notes

Two positive control samples and a negative control (a matrix blank) are extracted and analyzed with each batch of samples.

Methanol must not be used to rinse the autoinjector syringe because it hydrolyzes the derivatives formed in this procedure. Anhydrous ethyl acetate is used instead.

For cannabinoids to be reported as present, the immunoassay urine screen and urine cannabinoids confirmation must both show the presence of cannabinoids.

The specimens may also be extracted by inversion in lieu of using the tube extractor. The samples must be extracted in a manner equivalent to rotation.

This method is qualitative, so quantitative results must not be reported. It is only used to confirm the presence or absence of ( $\pm$ )-11-nor-9-Carboxy- $\Delta$ 9-THC in a specimen.

The performance of the controls will be evaluated by a second analyst, and a record of this evaluation will be recorded on a batch worksheet and maintained in the case record.

**Preparation of Materials**

*60% KOH:*

Add 60 g potassium hydroxide slowly to approximately 75 mL deionized water with stirring, being careful not to generate too much heat. When the solid has dissolved, make up to 100 mL of solution with deionized water.

*Extraction solvent (9:1 hexane:ethyl acetate):*

Combine 9 parts hexane and 1 part ethyl acetate and mix well.

**5.4.5.1.7 Morphine and 6-Monoacetylmorphine with MBTFA (Liquid Extraction)****Scope**

This method is designed to detect the presence and quantitative amount of morphine and 6-monoacetylmorphine, which are extracted from their biological matrix by liquid-liquid extraction, derivatized, and detected by SIM monitoring of the ions of the derivatives.

This method is applicable to blood, urine, tissue homogenates, and other biological fluids.

**Chemicals and Reagents**

- Concentrated acetic acid
- Hexane (A.C.S. grade)
- Concentrated hydrochloric acid (A.C.S. grade)
- Absolute methanol
- Sodium carbonate (A.C.S. grade)
- Sodium hydroxide (A.C.S. grade)
- Toluene (A.C.S. grade)
- Isoamyl alcohol (A.C.S. grade)
- Ethyl acetate (A.C.S. grade)
- Deionized water
- pH 9.1 carbonate buffer
- Extraction solvent (78:20:2 toluene:hexane:isoamyl alcohol)
- N sodium hydroxide
- N-methyl-bis(trifluoroacetamide) (MBTFA)

**Controls**

- Certified reference material for morphine, 6-monoacetylmorphine, and nalorphine

**Equipment**

- 15 mL screw cap extraction tubes with caps
- 5 mL conical centrifuge tubes with caps
- Rotator
- Vortex mixer
- Heating block
- Evaporation manifold
- Class A pipets and volumetric flasks
- Analytical balance
- Autosampler vials with inserts and crimp-on caps with rubber septa
- Crimper

**Instrumentation**

Gas chromatograph:	Agilent 5890 or equiv	Column type:	ZB-5 or equiv
Mass spectrometer:	Agilent 5971 or equiv	Length (m):	15

Autosampler:	Agilent 7673 or equiv	ID (mm):	0.25
		Film thickness (µm):	0.25

**Instrument conditions**

Inlet		Detector	
Mode:	Splitless	Detector:	MSD
Inlet temp (°C):	250	Transfer line temp (°C):	280
Column head pressure (kPa):	125	Resolution:	High
Gas type:	Helium	Dwell per ion (ms):	50
		Solvent delay (min):	6.5 (variable)

**Temperature Ramp**

Rate (C°/min)	Temperature (°C)	Time (min)
	50	0.5
30	200	0
20	330	1.5

**Ions Monitored**

Morphine:	364, 477, 311
6-Monoacetylmorphine:	364, 423, 311
Nalorphine:	390, 503

**Procedure**

1. Label the proper number of 15mL extraction tubes
2. Add 4 mL of blank blood to the tubes for standards and controls
3. Add the appropriate amount of each analyte to the tubes for each calibration curve point
4. Add 4 mL of specimen into the appropriate tubes
5. Add 100 µL of 10µg/mL nalorphine to each tube as an internal standard
6. Add 4 mL of pH 9.1 sodium carbonate buffer to each tube
7. Add 5 mL of extraction solvent to each tube
8. Cap and extract on rotator for approximately 10 minutes or until extracted
9. Remove tubes and centrifuge until separated
10. Transfer the top organic layer of each tube to a properly labeled 15 mL screw cap extraction tube
11. Evaporate to dryness under inert gas with the evaporation manifold at approximately 60-70°C
12. Add 40 µL MBTFA to each tube, cap, vortex, and heat at approximately 60-70°C for 20 minutes
13. Add 150 µL of anhydrous ethyl acetate to each tube, vortex, and transfer to an appropriately labeled autosampler vial equipped with an insert

14. Place vials in autosampler tray and set up a sequence ensuring that a blank is injected before each sample or control run to detect possible carryover from one specimen to the next
15. Run the sequence using a SIM method that monitors m/z 311, 364, 390, 423, 477, and 503 throughout the run.

#### Quality Assurance, Interpretation, Precautions, and Notes

The calibration curve should extend from 0.025 µg/mL to 2 µg/mL for each analyte. The calibration curve must have a correlation coefficient of at least 0.990 and the measured value of no curve point may vary more than 20% from the known value of that curve point, with the exception of the lowest point on the curve, which may vary up to 30% from its known value.

At least one positive control must be extracted with the samples and analyzed in the same manner. This control must be prepared from a different source than the calibration curve.

The measured value may differ by up to 20% from the known value. A negative control (matrix blank) must also be extracted and analyzed with each batch of samples.

If morphine is determined to be present, the ions for 6-monoacetylmorphine must be scanned to determine whether it is also present. Standards for 6-monoacetylmorphine must also be run

Methanol must not be used to rinse the autoinjector syringe because it hydrolyzes the derivatives formed in this procedure. Anhydrous ethyl acetate is used instead.

Reinjection of samples must occur within 12 hours of the original injection due to breakdown of the derivatives formed in this procedure.

Deuterated internal standards may be used in lieu of nalorphine if their ions are added to the SIM ion list.

The following ions should be used to identify any drugs present:

Drug	Quant Ion	Qualifier Ion 1	Qualifier Ion 2
Morphine	364	477	311
6-Monoacetylmorphine	364	423	311
Nalorphine	390	503	-

To confirm a drug as present, the ratio of the intensities of the quantitation ion and the qualifier ion must not vary more than 20% relative to the ratio of these two ions in the control samples. If co-elution is suspected, the chromatographic parameters may be changed in order to remove the interference.

The specimens may also be extracted by inversion in lieu of using the tube extractor. The samples must be extracted in a manner equivalent to rotation.

The performance of the calibrators and controls will be evaluated by a second analyst, and a record of this evaluation will be recorded on a batch worksheet and maintained in the case record.

**Preparation of Materials**

*pH 9.1 carbonate buffer:*

Add 10.6 g Na<sub>2</sub>CO<sub>3</sub> to a class A 100 mL volumetric flask and dilute to the mark with deionized water. Adjust to pH 9.1 with acetic acid. Stable for 6 months at room temperature.

*Extraction solvent (78:20:2 toluene:hexane:isoamyl alcohol):*

Mix 78 mL toluene, 20 mL hexane, and 2 mL isoamyl alcohol. Stable for one month at room temperature.

*8N sodium hydroxide:*

Add 32 grams NaOH to a class A 100 mL volumetric flask and slowly add sufficient deionized water to make up to the line, ensuring the solution does not become too hot.

#### 5.4.5.1.8 Hydromorphone with MBTFA (Liquid Extraction)

##### Scope

This method is designed to detect the presence and quantitative amount of hydromorphone, which is extracted from its biological matrix by liquid-liquid extraction, derivatized, and detected by SIM monitoring of the ions of its derivative.

This method is applicable to blood, urine, tissue homogenates, and other biological fluids.

##### Chemicals and Reagents

- Concentrated acetic acid
- Hexane (A.C.S. grade)
- Concentrated hydrochloric acid (A.C.S. grade)
- Absolute methanol
- Sodium carbonate (A.C.S. grade)
- Sodium hydroxide (A.C.S. grade)
- Toluene (A.C.S. grade)
- Isoamyl alcohol (A.C.S. grade)
- Ethyl acetate (A.C.S. grade)
- Deionized water
- pH 9.9 carbonate buffer
- Extraction solvent (78:20:2 toluene:hexane:isoamyl alcohol)
- N sodium hydroxide
- N-methyl-bis(trifluoroacetamide) (MBTFA)

##### Controls

- Certified reference material for morphine, hydromorphone, codeine, 6-monoacetylmorphine, and nalorphine

##### Equipment

- 15 mL screw cap extraction tubes with caps
- 5 mL conical centrifuge tubes with caps
- Rotator
- Vortex mixer
- Heating block
- Evaporation manifold
- Class A pipets and volumetric flasks
- Analytical balance
- Autosampler vials with inserts and crimp-on caps with rubber septa
- Crimper

**Instrumentation**

Gas chromatograph:	Agilent 5890 or equiv	Column type:	DB-5MS or equiv
Mass spectrometer:	Agilent 5971 or equiv	Length (m):	30
Autosampler:	Agilent 7673 or equiv	ID (mm):	0.20
		Film thickness (µm):	0.33

**Instrument conditions**

Inlet		Detector	
Mode:	Splitless	Detector:	MSD
Inlet temp (°C):	250	Transfer line temp (°C):	280
Column head pressure (kPa):	125	Resolution:	High
Gas type:	Helium	Dwell per ion (ms):	100
		Solvent delay (min):	12 (variable)

**Temperature Ramp**

Rate (C°/min)	Temperature (°C)	Time (min)
	100	2
20	280	5
30	300	4

**Ions Monitored**

Hydromorphone:	325, 381
Nalorphine:	390, 503

**Procedure**

1. Label the proper number of 15mL extraction tubes
2. Add 4 mL of blank blood to the tubes for standards and controls
3. Add the appropriate amount of each analyte to the tubes for each calibration curve point
4. Add 4 mL of specimen into the appropriate tubes
5. Add 100 µL of 10µg/mL nalorphine to each tube as an internal standard
6. Add 4 mL of pH 9.9 sodium carbonate buffer to each tube
7. Add 5 mL of extraction solvent to each tube
8. Cap and extract on rotator for approximately 10 minutes or until extracted
9. Remove tubes and centrifuge until separated
10. Transfer the top organic layer of each tube to a properly labeled 15 mL screw cap extraction tube
11. Evaporate to dryness under inert gas with the evaporation manifold at approximately 60-70°C
12. Add 40 µL MBTFA to each tube, cap, vortex, and heat at approximately 50-60°C for 20 minutes
13. Add 150 µL of anhydrous ethyl acetate to each tube, vortex, and transfer to an appropriately labeled autosampler vial equipped with an insert

14. Place vials in autosampler tray and set up a sequence ensuring that a blank is injected before each sample or control run to detect possible carryover from one specimen to the next
15. Run the sequence using a SIM method that monitors m/z 325, 364, 381, 390, 477, and 503 throughout the run.

#### Quality Assurance, Interpretation, Precautions, and Notes

The calibration curve should extend from 0.025 µg/mL to 2 µg/mL for each analyte. The calibration curve must have a correlation coefficient of at least 0.990 and the measured value of no curve point may vary more than 20% from the known value of that curve point, with the exception of the lowest point on the curve, which may vary up to 30% from its known value.

At least one positive control must be extracted with the samples and analyzed in the same manner. This control must be prepared from a different source than the calibration curve.

The measured value may differ by up to 20% from the known value. A negative control (matrix blank) must also be extracted and analyzed with each batch of samples.

Hydromorphone may also be extracted using the same method as for morphine and 6-monoacetylmorphine. All samples and controls must be extracted using the same extraction method.

Methanol must not be used to rinse the autoinjector syringe because it hydrolyzes the derivatives formed in this procedure. Anhydrous ethyl acetate is used instead.

Reinjection of samples must occur within 12 hours of the original injection due to breakdown of the derivatives formed in this procedure.

Samples must not be derivatized at a higher temperature or a longer time than listed. Doing so may cause the formation of a di-TMS derivative identical to that of derivatized morphine instead of the mono-TMS hydromorphone derivative.

Deuterated internal standards may be used in lieu of nalorphine if their ions are added to the SIM ion list.

The following ions should be used to identify any drugs present:

Drug	Quantitation ion	Qualifier ion
Hydromorphone	325	381
Nalorphine	390	503

To confirm a drug as present, the ratio of the intensities of the quantitation ion and the qualifier ion must not vary more than 20% relative to the ratio of these two ions in the control samples. If co-elution is suspected, the chromatographic parameters may be changed in order to remove the interference.

The specimens may also be extracted by inversion in lieu of using the tube extractor. The samples must be extracted in a manner equivalent to rotation.

The performance of the calibrators and controls will be evaluated by a second analyst, and a record of this evaluation will be recorded on a batch worksheet and maintained in the case record.

**Preparation of Materials**

*pH 9.9 carbonate buffer:*

Add 10.6 g Na<sub>2</sub>CO<sub>3</sub> to a class A 100 mL volumetric flask and dilute to the mark with deionized water. Adjust to pH 9.9 with acetic acid. Stable for 6 months at room temperature.

*Extraction solvent (78:20:2 toluene:hexane:isoamyl alcohol):*

Mix 78 mL toluene, 20 mL hexane, and 2 mL isoamyl alcohol. Stable for one month at room temperature.

*8N sodium hydroxide:*

Add 32 grams NaOH to a class A 100 mL volumetric flask and slowly add sufficient deionized water to make up to the line, ensuring the solution does not become too hot.

#### 5.4.5.1.9 Cyanide screen and quantitation

##### Scope

This method is designed to detect and quantitate the cyanide ion in blood or other biological samples using spectrophotometry.

This method is applicable to blood, urine, vitreous, bile, gastric contents, or tissue homogenate. Specimen amount varies according to specimen availability, but 1 mL of blood, urine, vitreous, or bile or 1 g of gastric contents or a 1:4 tissue homogenate is generally used.

##### Chemicals and Reagents

- Deionized water
- N Sodium hydroxide
- 10% Sulfuric acid
- 0.25% Chloramine T
- Phosphate solution
- Barbituric acid reagent (make fresh daily)
- Sodium cyanide or potassium cyanide

##### Controls

- 0.50 mg/mL cyanide stock
- 5.0 µg/mL cyanide control

##### Equipment

- UV-Visible spectrophotometer
- Conway diffusion cells

##### Procedure

1. Prepare a Conway diffusion cell for each standards, blank, or specimen to be tested
2. To the center ring, add 0.5 mL of 0.1 N sodium hydroxide with a micropipettor
3. To the second ring, add 0.5 mL of 10% sulfuric acid with a micropipettor
4. To the second ring, add 1 mL of each standard or specimen and immediately seal the dish
5. For the 0.5 µg/mL standard, add 100 µL of the 5.0 µg/mL cyanide control and 900 µL deionized water
6. For the 1.0 µg/mL standard, add 200 µL of the 5.0 µg/mL cyanide control and 800 µL deionized water
7. For the 2.0 µg/mL standard, add 400 µL of the 5.0 µg/mL cyanide control and 600 µL deionized water
8. For the 5.0 µg/mL standard, add 1000 µL of the 5.0 µg/mL cyanide control
9. For the blank, add 1000 µL of blank blood

10. Allow the samples to sit for approximately two hours
11. Transfer 200 µL of the solution in the center ring to a clean, labeled 15 mL extraction tube
12. Add 1 mL of phosphate solution to each tube
13. Add 500 µL of Chloramine T solution to each tube
14. Vortex each tube and allow to sit for approximately three minutes
15. Add 1.5 mL of barbituric acid reagent to each sample and vortex
16. Allow the samples to sit for approximately ten minutes
17. Read the absorbance of each solution at 586 nm
18. Construct a quantitation curve using the standards and quantitate each case specimen using this curve

#### **Quality Assurance, Interpretation, Precautions, and Notes**

A quantitative value for cyanide above zero indicates its presence.

Cyanide salts and solutions are extremely toxic and great care should be taken in their handling.

The cyanide solutions should be disposed of when no longer needed by placing the cyanide solution in a beaker in an ice bath in a hood, followed by the slow addition of a 5.25% solution (approximately) of sodium hypochlorite. This converts the cyanide to cyanate ( $\text{NaCN} + \text{NaOCl} \rightarrow \text{NaOCN} + \text{NaCl}$ ). Care should be taken that this solution does not get too hot. When a 50% excess of hypochlorite has been added and heat is no longer being evolved, the mixture is allowed to stand for several hours and may be washed down the drain with excess water.

#### **Preparation of Materials**

##### *0.50 N Sodium hydroxide:*

Add approximately 50 mL of deionized water to a 100 mL class A volumetric flask. Add 0.40 g sodium hydroxide, making sure that the solution does not get too hot. Dilute to the mark with deionized water and mix well.

##### *10% Sulfuric acid:*

Add approximately 10 mL of deionized water to a 25 mL class A volumetric flask. Slowly add 2.5 mL of concentrated sulfuric acid, taking care that the solution does not get too hot. Dilute to the mark with deionized water and mix well.

##### *0.25% Chloramine T:*

Add approximately 10 mL of deionized water to a 25 mL class A volumetric flask. Add 0.0625 g of Chloramine T. Dilute to the mark with deionized water and mix well.

##### *Phosphate solution:*

Add approximately 10 mL of deionized water to a 25 mL class A volumetric flask. Add 3.45 g of sodium phosphate monobasic. Dilute to the mark with deionized water and mix well.

*Barbituric acid reagent (make fresh daily):*

Add 7.5 mL of pyridine to a 25 mL class A volumetric flask. Add 1.5 g barbituric acid. Slowly add 1.5 mL of concentrated hydrochloric acid, taking care that the solution does not get too hot. Dilute to the mark with deionized water and mix well.

*0.50 mg/mL cyanide stock:*

In a 25 mL class A volumetric flask, place approximately 10 mL of deionized water. Add 2 mL of 0.1 N sodium hydroxide. Add 0.0313 g of potassium cyanide or 0.0235 g of sodium cyanide. Dilute to the mark with deionized water and mix well.

*5.0 µg/mL cyanide control:*

In a 25 mL class A volumetric flask, add 250 µL of the 0.50 mg/mL cyanide stock solution. Dilute to the mark with deionized water and mix well.

#### 5.4.5.1.10 Carbon Monoxide

The presence of carbon monoxide will be confirmed by two methods if the case history is inconsistent with the results of the assay and if specimen size allows. In each case a negative control consisting of blood bank blood must be analyzed. If the negative control shows the presence of carboxyhemoglobin (COHb) (above 5% saturation) further investigation and appropriate action is warranted. Only samples containing hemoglobin are appropriate to analyze using these methods.

##### 5.4.5.1.10.1 Carbon Monoxide by Diffusion Cell

#### Scope

This method is designed to detect the presence of carboxyhemoglobin (COHb) in blood. The results are determined by the presence or absence of a metallic film in the center well of a Conway diffusion cell.

This method is applicable to blood. The sample size required is 0.5 mL.

#### Chemicals and Reagents

- 0.005N Palladium chloride
- 0.1N Hydrochloric acid
- 3.6N Sulfuric acid
- Light grease

#### Controls

- Positive controls are obtained from IL Instrumentation Laboratory.
- Blank blood

#### Equipment

- Conway diffusion cell with cover
- Pipets
- Vaseline or other light grease

#### Procedure

1. Pipet 3 mL of 0.005N palladium chloride in 0.1N hydrochloric acid into the center well of each Conway diffusion cell.
2. Pipet 1 mL of 3.6N sulfuric acid into the outer well of each cell.
3. Lightly line the seal of each cell with Vaseline or similar light grease.
4. Without mixing with the acid, add 0.5 mL of the sample or control to be tested to each outer cell, put its cover glass in place and carefully mix the contents of the outer cell. Allow the cells to stand for at least two hours.

#### Quality Assurance, Interpretation, Precautions, and Notes

A positive control obtained from IL Instrumentation Laboratory and a negative control of blood bank blood are run to ensure that the assay responds appropriately to the presence of carbon monoxide. The positive control must be clearly more positive than the negative control. The negative control must not have any metallic film.

Appearance of a metallic film on the surface of the inner cell liquid indicates that carbon monoxide was released from the blood. The minimum detection limit of this procedure is considered to be 15% saturation.

Only samples containing hemoglobin are appropriate to analyze using this method. This test is a screen only and does not give quantitative results.

### **Preparation of Materials**

#### *0.1N Hydrochloric acid:*

In a 100 mL volumetric flask add approximately 50 mL of deionized water. Slowly add 830  $\mu$ L of concentrated hydrochloric acid and vortex gently. Dilute up to the mark with deionized water and mix well.

#### *0.005N Palladium chloride:*

Dissolve 0.44 g palladium chloride in 500 mL 0.1N HCl and allow to stand overnight. Dilute to 1 L with 0.1N HCl.

#### *3.6N Sulfuric acid:*

Add 10.0 mL concentrated sulfuric acid to a class A 100 mL volumetric flask and make up to the mark with deionized water.

#### 5.4.5.1.10.2 Carbon Monoxide by UV-Vis Spectrometer

##### Scope

This method is designed to detect the presence of carboxyhemoglobin (COHb) in blood. The results are determined by multi-wavelength spectrophotometry using a UV-Visible spectrometer.

This method is applicable to blood. The sample size required is 0.02 mL.

##### Chemicals and Reagents

- Sodium hydrosulfite
- 0.1% Sodium carbonate
- 5N Sodium hydroxide
- Water
- Blank blood

##### Controls

- Positive controls are obtained from IL Instrumentation Laboratory.
- Blank blood

##### Equipment

- UV-Visible spectrometer
- Matched cuvettes
- Micropipettes and tips

##### Procedure

1. Turn on the UV-Visible spectrometer and let the lamps warm up before analysis.
2. Add approximately 2 milligrams of solid sodium hydrosulfite to a cuvette containing approximately 2.5 milliliters of 0.1% sodium carbonate.
3. Add 10 microliters of blood and mix.
4. Add 200 microliters of 5N sodium hydroxide to the cuvette and mix.
5. Read the absorbances at 532 and 558 nanometers, with water used as the blank.
6. Calculate the carboxyhemoglobin saturation as:  $67 * (2.44 - A_{558} / A_{532})$
7. Turn off the UV-Visible spectrometer lamps

##### Quality Assurance, Interpretation, Precautions, and Notes

A positive control obtained from IL Instrumentation Laboratory and a negative control of blood bank blood are run to ensure that the assay responds appropriately to the presence of carbon monoxide. The positive control must be within the limits established by the manufacturer for the appropriate lot of controls.

Two samples are run and the results must agree to within  $\pm 3\%$  from the mean. The mean of the two results is reported.

The matrix blank cannot contain more than 5% carboxyhemoglobin saturation. The positive control must be within the widest listed acceptable range reported by the manufacturer. If either control is out of range, it may be rerun.

Results below 5% carboxyhemoglobin saturation are reported as "<5 % saturation". Results above the range of controls must be reported "greater than" the highest value for the highest control rounded to the nearest integer. In the intermediate range, results are reported as the average saturation value rounded to the nearest integer.

Only samples containing hemoglobin are appropriate to analyze using this method.

### **Preparation of Materials**

#### *5N Sodium hydroxide:*

Slowly add 100 g of sodium hydroxide to 500 mL of deionized water, stirring gently. Take care that the solution does not become too hot.

#### *0.1% sodium carbonate:*

Add 0.25 g of sodium carbonate to 250 mL of deionized water, mixing well.

### **Literature References**

Journal of Forensic Sciences, Vol. 27, No. 4, Oct. 1982, pp. 928-934

**5.4.5.1.11 Gamma-hydroxybutyrate (GHB) screen and quantitation****Scope**

This method is designed to detect the presence of gamma-hydroxybutyrate by mass spectrometry. The gamma-hydroxybutyrate is extracted from its biological matrix by liquid-liquid extraction, derivatized, and detected by monitoring of the derivative ions.

Quantitation is performed by comparison to extracted standards. Confirmation of the presence of gamma-hydroxybutyrate is obtained by acquiring a mass spectrum of the derivative.

This method is applicable to urine specimens, although alternate specimens can be used if necessary. A 200 µL sample is generally used.

**Chemicals and Reagents**

- Anhydrous ethyl acetate
- MSTFA

**Controls**

- GHB
- GHB-d6

**Equipment**

- Test tubes
- Pipets and pipettors
- Vortex
- Centrifuge
- Evaporation manifold with inert gas source (generally nitrogen)
- Autosampler vials with inserts and crimp-on caps with rubber septa
- Crimper

**Instrumentation**

Gas chromatograph:	Agilent 5890 or equiv	Column type:	ZB-5 or equiv
Mass spectrometer:	Agilent 5971 or equiv	Length (m):	15
Autosampler:	Agilent 7673 or equiv	ID (mm):	0.25
		Film thickness (µm):	0.25

**Instrument conditions**

<b>Inlet</b>		<b>Detector</b>	
Mode:	Splitless	Detector:	MSD
Inlet temp (°C):	250	Transfer line temp (°C):	280
Column head pressure (kPa):	125	Resolution:	High
Gas type:	Helium	Dwell per ion (ms):	50
		Solvent delay (min):	2.45 (variable)

**Temperature Ramp**

Rate (C°/min)	Temperature (°C)	Time (min)
	50	0.5
30	200	0
20	330	1.5

Ions monitored:	233, 234, 239, 240
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**Procedure**

1. Pipet 200 µL of each specimen or blank urine into a properly labeled test tube for each case, curve point, or control
2. Add 100 µL of 50 µg/mL GHB-d6 internal standard to each tube
3. Add 500 µL methanol to each tube
4. Vortex and centrifuge for approximately 5 minutes or until separated
5. If solid material is precipitated, transfer the supernatant to a new test tube
6. Evaporate each sample to dryness under nitrogen at approximately 40°C (not more than 50°C)
7. Add 75 µL of anhydrous ethyl acetate to each tube
8. Add an extra 75 µL of anhydrous ethyl acetate to the tube for the highest curve point
9. Add 75 µL of MSTFA to each tube
10. Layer with nitrogen and seal each tube with paraffin film
11. Derivatize at approximately 60°C for 30 minutes
12. Transfer each sample to an autosampler vial with an insert
13. Place vials in autosampler tray and set up a sequence ensuring that a blank is injected before each sample or control run to detect possible carryover from one specimen to the next.
14. Run the sequence using a SIM method that monitors m/z 233, 234, 239, and 240.
15. If the presence of GHB at a urine concentration of above 10 µg/mL is indicated, run that sample in scan mode to obtain a full mass spectrum for confirmation, along with the extracted blank and an extracted standard at approximately the same concentration.

**Quality Assurance, Interpretation, Precautions, and Notes**

The ratio of the qualifier ion(s) relative to the quantitation ion may not differ more than 20%. If the ion ratios differ more than 20%, the presence can still be confirmed by comparison of the full mass spectra.

The retention time of any analyte may not differ more than 2% from the retention time of its control.

Curve points must be run bracketing the concentration of 10 µg/mL. A suggested curve is:

Curve point (GHB Na salt)	(GHB)	Add to tube
---------------------------	-------	-------------

0 µg/mL	0 µg/mL	Blank urine only
2.5 µg/mL	2.044 µg/mL	50 µL of 10 µg/mL GHB sodium salt
5 µg/mL	4.088 µg/mL	100 µL of 10 µg/mL GHB sodium salt
10 µg/mL	8.177 µg/mL	200 µL of 10 µg/mL GHB sodium salt
20 µg/mL	16.35 µg/mL	40 µL of 100 µg/mL GHB sodium salt
40 µg/mL	32.71 µg/mL	80 µL of 100 µg/mL GHB sodium salt

Positive controls should be run at approximately 10 µg/mL and at approximately 40 µg/mL. A suggested addition is:

Control (GHB Na salt)	(GHB)	Add to tube
10 µg/mL	8.177 µg/mL	40 µL of 50 µg/mL GHB sodium salt
25 µg/mL	20.44 µg/mL	100 µL of 50 µg/mL GHB sodium salt

A negative control (a urine matrix blank) must also be analyzed with each batch of specimens.

Any urine specimen in which GHB is present at above 10 µg/mL in the urine must be confirmed by comparing the full mass spectrum with that of an extracted standard, and contrasting with an extracted blank.

Methanol must not be used to rinse the autoinjector syringe because it hydrolyzes the derivatives formed in this procedure. Anhydrous ethyl acetate is used instead. The molecular weight of GHB is 103.0975 amu. The molecular weight of GHB sodium salt is 126.0873 amu. To convert a concentration from GHB sodium salt to GHB, multiply the concentration by 0.8177.

The performance of the controls will be evaluated by a second analyst, and a record of this evaluation will be recorded on a batch worksheet and maintained in the case record.

This method is taken with modification from *Application of a Convenient Extraction Procedure to Analyze Gamma-Hydroxybutyric Acid in Fatalities Involving Gamma-Hydroxybutyric Acid, Gamma-Butyrolactone, and 1,4-Butanediol* by W.C. Duer, K.L. Byers, and J.V. Martin (Journal of Analytical Toxicology, Volume 25, October 2001, pp. 576-582).

### Preparation of Materials

#### 50 µg/mL GHB-d6:

Add 500 µL of a 1 mg/mL certified reference material to a 10 mL class A volumetric flask and make up with methanol.

#### 50 µg/mL GHB sodium salt (81.77 µg/mL GHB) from certified reference material:

Add 500 µL of a 1 mg/mL certified reference material to a 10 mL class A volumetric flask and make up with methanol.

#### 100 µg/mL GHB sodium salt (81.77 µg/mL GHB) from powder:

Add 0.0250 g GHB sodium salt to a 25mL class A volumetric flask and make up with methanol.

#### 5.4.5.1.12 Cocaine and Benzoylcegonine by Solid Phase Extraction and Gas Chromatography-Mass Spectrometry

##### Scope

This method is designed to detect the presence and amount of cocaine and benzoylcegonine. The analytes are extracted from their biological matrix by liquid-liquid extraction, derivatized, and detected by monitoring of selected ions. Quantitation is performed by comparison to extracted standards.

This method is applicable with all specimen types, provided that the standards and controls are prepared in the appropriate matrix.

##### Chemicals and Reagents

- Deionized water
- Methanol
- Ammonium hydroxide
- Acetonitrile
- Na<sub>2</sub>HPO<sub>4</sub> (Sodium phosphate, dibasic)
- NaH<sub>2</sub>PO<sub>4</sub>•H<sub>2</sub>O (Sodium phosphate monobasic monohydrate)
- Hydrochloric acid
- Elution solvent
- BSTFA with 1% TMCS

##### Controls

- Cocaine in acetonitrile
- Benzoylcegonine in acetonitrile
- 0.01 mg/mL Cocaine-d3 in acetonitrile
- 0.01 mg/mL Benzoylcegonine-d3 (BE-d3) in acetonitrile

##### Equipment

- SPE Manifold
- Mixed-mode SPE tube (octyl and benzenesulfonic acid, such as UCT Clean Screen CSDAU206)
- Test tubes
- Pipets and pipettors
- Vortex
- Centrifuge
- Evaporation manifold with inert gas source (generally nitrogen)
- Autosampler vials with inserts and crimp-on caps with rubber septa
- Crimper

**Instrumentation**

Gas chromatograph:	Agilent 6890 or equiv
Mass spectrometer:	Agilent 5973 or equiv
Autosampler:	Agilent 7683 or equiv

Column type:	ZB-5 or equiv
Length (m):	15
ID (mm):	0.25
Film thickness (µm):	0.25

**Instrument conditions**

<b>Inlet</b>	
Mode:	Pulsed splitless
Inlet temp (°C):	250
Pressure (psi):	5.4 (variable)
Pulse pressure (psi):	20.0
Pulse time (min):	0.50
Purge flow (mL/min):	20.7
Purge time (min):	2.00
Total flow (mL/min):	24.5
Gas saver:	On
Saver flow (mL/min):	20.0
Saver time (min):	2.00
Gas type:	Helium

<b>Column</b>	
Mode:	Constant pressure
Pressure (psi):	5.4195
Initial flow (mL/min):	0.755
Avg. velocity (cm/sec):	23.4
<b>Detector</b>	
Detector:	MSD
Transfer line temp (°C):	280
Quad temp (°C):	150
Source temp (°C):	250
Mass range (amu):	50-550
Threshold:	150
Number of samples:	2
Solvent delay (min):	4 (variable)

**Temperature Ramp**

Rate (°C/min)	Temperature (°C)	Time (min)
	100	0.5
30	220	0
10	330	0

**Procedure****Sample Preparation**

- To one milliliter of specimen, add 50 µL of internal standard and 4 mL of deionized water.
- Mix or vortex and let stand for 5 minutes.
- Centrifuge for 5 minutes and discard pellet (if present).
- Add 2 mL 0.1M phosphate buffer (pH 6.0) and mix or vortex.
- The sample pH should be 6.0±0.5. Adjust if necessary with Na<sub>2</sub>HPO<sub>4</sub> (lowers pH) or NaH<sub>2</sub>PO<sub>4</sub>•H<sub>2</sub>O (raises pH).

**Column Conditioning**

- Add 3 mL methanol and aspirate to waste at low pressure (less than 3 in Hg).
- Add 3 mL deionized water and aspirate to waste at low pressure (less than 3 in Hg).
- Add 1 mL 0.1M phosphate buffer (pH 6.0) and aspirate to waste at low pressure (less than 3 in Hg).
- Ensure that the column does not dry after conditioning.

5. Load prepared specimen into SPE column and aspirate at 1 to 2 mL/minute.

#### Column Washing

1. Add 2 mL deionized water and aspirate to waste at low pressure (1-2 mL/min).
2. Add 2 mL 0.1M hydrochloric acid and aspirate to waste at low pressure (1-2 mL/min).
3. Add 3 mL methanol and aspirate to waste at low pressure (1-2 mL/min).
4. Completely dry the column under high pressure (>10 in Hg).

#### Elution

1. Add 3 mL of elution solvent and collect eluate at low pressure (1-2 mL/min).
2. Sample Derivatization
3. Dry eluate at less than 40°C.
4. Add 50 µL ethyl acetate.
5. Add 50 µL BSTFA with 1% TMCS.
6. Overlay with dry nitrogen, cap, and mix or vortex.
7. Derivatize for 20 minutes at 70°C.
8. Remove from heat source and let cool.

#### Analysis

1. Inject on GC-MS in SIM mode monitoring the ions:

Drug	Quant Ion	Qualifier Ion 1	Qualifier Ion 2
Cocaine	182	303	272
Cocaine-d3	185	306	275
BE	240	361	256
BE-d3	243	364	259

#### Quality Assurance, Interpretation, Precautions, and Notes

The ratio of the qualifier ion(s) relative to the quantitation ion may not differ more than 20%. If the ion ratios differ more than 20%, the presence can still be confirmed by comparison of the full mass spectra.

The retention time of any analyte may not differ more than 2% from the retention time of its control.

The suggested standard curve consists of the points 0.05, 0.1, 0.5, 1.0, and 1.5 µg/mL of each analyte. Two positive controls must be run with each batch and hit within 20% of the target value. An negative control (a matrix blank) containing internal standard must be run with each batch, and not contain any drug above the lower limit of quantitation.

Results obtained using this method may only be reported if the presence of a cocaine related compound is indicated by another detection technique, such as immunoassay or scan-mode mass spectrometry.

A case may not be reported as positive if indicated to be present below the LOD or LOQ for this assay.

Methanol must not be used to rinse the autoinjector syringe because it hydrolyzes the derivatives formed in this procedure. Anhydrous ethyl acetate is used instead.

The performance of the calibrators and controls will be evaluated by a second analyst, and a record of this evaluation will be recorded on a batch worksheet and maintained in the case record.

### **Preparation of Materials**

#### *0.1M Phosphate buffer:*

Dissolve 0.17 g  $\text{Na}_2\text{HPO}_4$  and 1.214 g  $\text{NaH}_2\text{PO}_4 \cdot \text{H}_2\text{O}$  in 80 mL of deionized water. Dilute to 100 mL with deionized water. Adjust pH to  $6.0 \pm 0.1$  with  $\text{Na}_2\text{HPO}_4$  (raises pH) or  $\text{NaH}_2\text{PO}_4 \cdot \text{H}_2\text{O}$  (lowers pH). This solution may be stored for one month if refrigerated.

#### *0.1M Hydrochloric acid:*

Slowly add 4.2 mL of concentrated hydrochloric acid to 400 mL. Dilute to 500 mL with deionized water. This solution may be stored for six months at room temperature.

#### *Elution solvent:*

Mix 68 mL ethyl acetate, 28 mL methanol, and 4 mL ammonium hydroxide. This solution must be made daily for use.

#### 5.4.5.1.13 ELISA Drug Screening

##### Scope

Enzyme Linked Immunosorbent Assay (ELISA) is a competitive-binding immunoassay technique. It is used to indicate the presence or absence of a member of a class of drugs targeted by an antibody which binds preferentially with members of that class. This is determined by the response of the assay to a sample of unknown composition as compared to the response of a positive control of known composition.

Drug-class-specific antibodies coat the interior surfaces of the well of a 96-well plate. Each drug class has its own antibody and its own dedicated antibody coating. Sample is added to a microtiter well coated with this antibody and any drug in the sample will bind to the appropriate antibody binding sites. Then a combination enzyme conjugate is added, containing drugs labeled with horseradish peroxidase. The labeled drugs in the enzyme conjugate bind to the remaining antibody binding sites. After a reaction and equilibration period, the wells are emptied of liquid. When a chromogenic solution (tetramethylbenzidine (TMB)) is added, a color is produced in each well by the reaction of the TMB with the antibody-bound enzyme conjugate. The absorbance of the color in each well is proportional to the amount of labeled drug from the enzyme conjugate that is bound to the antibody binding sites. A stop solution (3N hydrochloric acid) is added to each well and the absorbance of each well at 450 nm is determined with a plate reader. The absorbance is inversely proportional to the amount of drug in the original sample.

This method is applicable with all specimen types, provided that the standards and controls are prepared in the appropriate matrix.

##### Chemicals and Reagents

- Millipore or reverse-osmosis purified water
- Enzyme conjugates (kit specific)
- TMB solution
- Stop solution

##### Controls

- Cutoff control
- Negative control

##### Instrumentation

- Thermo Multiskan 355 absorbance reader or equivalent

##### Equipment

- 8-channel micropipette
- Single channel micropipette
- Single channel automated pipette
- Micropipette solvent troughs

- Pipette tips
- ELISA plates (kit specific)

#### Instrument Conditions

- Measurement mode: Absorbance
- Measurement wavelength: 450 nm
- Reference wavelength: 650 nm
- Dual wavelength mode: Difference
- Reading mode: Accuracy
- Unit: OD

#### Procedure

1. Place the appropriate test strips in a 96-well plate holder.
2. Dispense 30  $\mu$ L of each sample or standard into the appropriate well.
3. Add 75  $\mu$ L of enzyme conjugate reagent into each well.
4. Tap the plate gently approximately ten times to mix.
5. Incubate the plate at room temperature for approximately thirty minutes.
6. Remove the liquid from each well by inverting and flicking the plate.
7. Rinse the wells several times with cold tap water.
8. Fill each well with rinse solution, and then invert the plate to remove the liquid from each well.
9. Rap the inverted plate on dry toweling to ensure that the wells contain no residual liquid.
10. Add 100  $\mu$ L of TMB chromogenic solution to each well.
11. Tap the plate gently to mix.
12. Incubate at room temperature for approximately fifteen minutes.
13. Add 50  $\mu$ L of stop solution to each well.
14. Tap the plate gently to mix.
15. Read the plate on a microplate reader at 450 nm. Plates must be read within five minutes of the previous step.

#### Quality Assurance, Interpretation, Precautions, and Notes

Controls will be made in the same matrix as the specimens, if possible. Matrix effects can be pronounced in ELISA. A cutoff control (with analyte at the decision point) and a negative control are required on each plate.

The cutoff control is provided by the manufacturer, and consists of the following analytes at the following concentrations:

<i>Assay</i>	<i>Target</i>	<i>Concentration</i>
Benzodiazepines	Temazepam	20 ng/mL
Cocaine	Cocaine	20 ng/mL
Methadone	( $\pm$ )-Methadone	20 ng/mL
Methamphetamines	d-Methamphetamine	50 ng/mL

Opiates	Morphine	20 ng/mL
Oxycodone	Oxycodone	20 ng/mL
Propoxyphene	d-Propoxyphene	20 ng/mL
THC	$\Delta$ 9-THC	15 ng/mL

The blank absorbance reading should be greater than 1.0 for each test. An absorbance greater than 4.0 in a matrix blank or case sample does not necessitate rerunning the assay.

Incubation times may be varied to bring absorbances in line with these values.

The mean of the ODs of the two case aliquots is compared to the calibrator to determine whether the specimen is positive. Widely disparate ODs from the same source warrants further investigation or repeating the affected test(s).

Protect the TMB solution from light and heat. If the solution has a blue tint it is unsuitable for use and should be discarded.

Ensure that the conjugate lot being used has been tested with the test strips being used, as indicated on the exterior of the plate packaging and that plates as well as conjugates are not expired.

Once opened, plates should be kept sealed in the original package and stored in a dry place.

A log is kept of the response of the cutoff control, as normalized to the appropriate negative control. This record is used by the analyst to determine whether the behavior of the assay is consistent with its recent performance.

#### 5.4.5.1.14 Benzodiazepines by Solid Phase Extraction and Gas Chromatography-Mass Spectrometry

##### Scope

This method uses solid-phase extraction (SPE) followed by selected ion monitoring gas chromatography-mass spectrometry (SIM GC-MS) to detect and quantitate alprazolam, 7-aminoclonazepam, clonazepam, diazepam, lorazepam, nordiazepam, oxazepam, and temazepam.

This method is applicable to blood, urine, and other matrices. Calibrators, controls, and blanks should be made in the appropriate matrix if possible. A 2 mL aliquot is normally used, but other aliquot amounts may be used if appropriate.

This method is designed to detect the presence and amount of several benzodiazepines.

The analytes are extracted from their biological matrix by solid-phase extraction (SPE), derivatized, and detected by monitoring of selected ions. Quantitation is performed by comparison to extracted standards.

This method is applicable with all specimen types, provided that the standards and controls are prepared in the appropriate matrix.

##### Chemicals and Reagents

- Acetonitrile
- Ammonium hydroxide
- Anhydrous ethyl acetate
- Water (deionized)
- Na<sub>2</sub>HPO<sub>4</sub> (Sodium phosphate, dibasic)
- NaH<sub>2</sub>PO<sub>4</sub>•H<sub>2</sub>O (Sodium phosphate monobasic monohydrate)
- BSTFA with 1% TMCS

##### Controls

- Alprazolam certified reference material, 1 mg/mL
- 7-Aminoclonazepam certified reference material, 1 mg/mL
- 7-Aminoclonazepam-D4 certified reference material, 0.1 mg/mL
- Clonazepam certified reference material, 1 mg/mL
- Clonazepam-D4 certified reference material, 0.1 mg/mL
- Diazepam certified reference material, 1 mg/mL
- Lorazepam certified reference material, 1 mg/mL
- Lorazepam-D4 certified reference material, 0.1 mg/mL
- Nordiazepam certified reference material, 1 mg/mL
- Oxazepam certified reference material, 1 mg/mL

- Temazepam certified reference material, 1 mg/mL

### Equipment

- SPE Extraction Manifold
- UCT Clean Screen XCELI SPE column (130 mg sorbent bed, 3 mL volume, part CSXCE103)
- 16x125 screw-cap culture tubes
- 16x100 test tubes
- Pipets and pipettors
- Vortex mixer
- Centrifuge
- Autosampler vials with caps
- Autosampler vial inserts
- Evaporation manifold with inert gas source (generally nitrogen)
- Autosampler vials with inserts and crimp-on caps with rubber septa
- Crimper

### Instrumentation

Gas chromatograph:	Agilent 6890 or equiv
Mass spectrometer:	Agilent 5973 or equiv
Autosampler:	Agilent 7683 or equiv

Column type:	ZB-5 or equiv
Length (m):	15
ID (mm):	0.25
Film thickness (µm):	0.25

### Instrument conditions

Inlet	
Mode:	Pulsed splitless
Inlet temp (°C):	250
Pressure (psi):	5.4 (variable)
Pulse pressure (psi):	20.0
Pulse time (min):	0.50
Purge flow (mL/min):	20.7
Purge time (min):	2.00
Total flow (mL/min):	25.7
Gas saver:	Off
Saver flow (mL/min):	20.0
Saver time (min):	2.00
Gas type:	Helium

Column	
Mode:	Constant pressure
Pressure (psi):	5.4195
Initial flow (mL/min):	0.755
Avg. velocity (cm/sec):	23.4
Detector	
Detector:	MSD
Transfer line temp (°C):	280
Quad temp (°C):	150
Source temp (°C):	250
Mass range (amu):	50-550
Threshold:	150
Number of samples:	2
Solvent delay (min):	2.45 (variable)

### Temperature Ramp

Rate (C°/min)	Temperature (°C)	Time (min)
	50	0.5
30	200	0

20	330	1.5
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**RapidTrace Program**

<i>Step</i>	<i>Source</i>	<i>Output</i>	<i>Vol</i>	<i>mL/min</i>	<i>Liquid Sense</i>
Purge-Cannula	MeOH	Cannula	5	42	No
Purge-Cannula	H2O	Cannula	5	42	No
Load	Sample	Biohazard	3	2	No
Rinse	CH3CN/H2O	Organic	2	3	No
Dry	---	Time=	20	min.	No
Collect	Elute	Fract1	1	2	No
Purge-Cannula	H2O	Cannula	5	42	No
Purge-Cannula	MeOH	Cannula	5	42	No

**Procedure**

## Sample Preparation

1. Add into labeled 16mm culture tubes:
2. 2 mL of matrix for the negative control
3. 2 mL of matrix for each calibrator
4. 2 mL of matrix for each positive control
5. 2 mL of specimen for each case aliquot
6. Add 50 µL of each internal standard solution
7. Add the appropriate amount of each analyte to each calibrator and positive control
8. Add 2 mL of 0.1M pH6 phosphate buffer and mix well
9. Centrifuge at approximately 3,000 rpm for approximately five minutes
10. Decant into a second 16mm culture tube

## Extraction

1. Add 2 mL of the sample to the SPE column
2. Wash with 2 mL of 20:80 acetonitrile:water
3. Dry under full vacuum for 20 minutes
4. Elute with 2 mL of 98:2 ethyl acetate: ammonium hydroxide

## Post-extraction

1. Evaporate to dryness at approximately 35°C
2. Add 50 µL of anhydrous ethyl acetate
3. Add 50 µL of BSTFA with 1% TMCS
4. Overlay with dry nitrogen, cap, and vortex
5. Heat at approximately 70°C for approximately 15 minutes in a heating block
6. Remove samples from the heating block and allow to cool to ambient
7. Transfer the sample to an insert in an autosampler vial

## Analyze with GC-MS, monitoring the ions:

<i>Analyte</i>	<i>Quant</i>	<i>Qual 1</i>	<i>Qual 2</i>
Clonazepam-D4 (IS)	391	356	310

Lorazepam-D4 (IS)	433	434	351
7-Aminoclonazepam-D4 (IS)	433	418	398
7-Aminoclonazepam	429	414	394
Alprazolam	279	308	204
Clonazepam	387	352	306
Diazepam	256	283	284
Lorazepam	429	430	347
Nordiazepam	341	342	343
Oxazepam	429	430	313
Temazepam	343	257	283

### Quality Assurance, Interpretation, Precautions, and Notes

The calibration curve typically extends from 0.02 µg/mL to 0.50 µg/mL. Two positive controls must be run with each batch and hit within 20% of the target value. A negative control (matrix blank) containing internal standard must be run with each batch, and not contain any drug above the limit of quantitation.

For an analyte to be reported as present, the ratio of the qualifier ion(s) relative to the quantitation ion may not differ more than 20% from the expected ratio. If the ion ratios differ more than 20%, the qualitative presence can still be confirmed by comparison of a full mass spectrum.

The retention time of any analyte may not differ more than 2% from the retention time of its control.

The performance of the calibrators and controls will be evaluated by a second analyst, and a record of this evaluation will be recorded on a batch worksheet and maintained in the case record.

### Preparation of materials

#### *0.1M pH 6 Phosphate Buffer:*

To a 100mL class A volumetric flask, add 0.17 grams Na<sub>2</sub>HPO<sub>4</sub> and 1.214 grams of NaH<sub>2</sub>PO<sub>4</sub>·H<sub>2</sub>O. Dilute to 100 mL with deionized water. Adjust to pH 6.0±0.1 with Na<sub>2</sub>HPO<sub>4</sub> (raises pH) and/or NaH<sub>2</sub>PO<sub>4</sub>·H<sub>2</sub>O (lowers pH). This solution may be stored for one month if refrigerated.

#### *20:80 Acetonitrile:Water (wash solvent):*

Add 20 mL acetonitrile to 80 mL deionized water and mix well. This solution must be made the same day it is used.

#### *98:2 Ethyl Acetate:Ammonium Hydroxide (elution solvent):*

Add 2 mL ammonium hydroxide to 98 mL anhydrous ethyl acetate and mix well. This solution must be made the same day it is used.

#### 5.4.5.1.15 LC-MS sMRM Drug Screen and Quantitation

##### Scope

This method is designed to screen and quantitate members of a targeted list of analytes by tandem liquid chromatography-mass spectrometry scheduled multiple reaction monitoring (LC-MS sMRM) analysis.

This method is validated for use with blood specimens only. Calibrators, controls, and extracted blanks should be made in the appropriate matrix. A 500 µL aliquot is normally used, but other aliquot amounts may be used if appropriate.

This method is designed to detect the presence of targeted analytes, with quantitation of a subset. The analytes are separated from their matrix by supported liquid extraction (SLE), separated from one another by HPLC, and detected by tandem mass spectrometry, monitoring two transitions for the analytes and one transition for isotopically-labeled internal standards.

##### Chemicals and Reagents

- Ultrapure water (17 megohm-cm or greater)
- HPLC grade acetonitrile (VWR part EM-AX0145P-1, or equivalent)
- LC-MS grade formic acid (Fisher part A117-50, or equivalent)
- Ammonium formate
- LC-MS grade methanol (Fisher part A456-4)
- Ammonium hydroxide
- HPLC grade ethyl acetate
- Sheep blood
- SLE plates (Biotage part 820-0400-P01, or equivalent)
- 96-well plate Nunc (Fisher part 12-565-606, or equivalent)

##### Controls

- Calibrator test mix
  - Cerilliant, 5 µg/mL each of the following drugs:
    - 6-monoacetylmorphine, acetyl fentanyl, acetyl norfentanyl, buprenorphine, codeine, dextromethorphan, dihydrocodeine, EDDP, fentanyl, hydrocodone, hydromorphone, meperidine, meprobamate, methadone, morphine, naloxone, naltrexone, norbuprenorphine, norfentanyl, normeperidine, norpropoxyphene, oxycodone, oxymorphone, propoxyphene, sufentanil, tramadol, amphetamine, benzoylecgonine, carisoprodol, cocaine, cyclobenzaprine, MDA, MDEA, MDMA, methamphetamine, phencyclidine, phentermine, 7-aminoclonazepam, alpha-hydroxyalprazolam, alprazolam, clonazepam, diazepam, flunitrazepam, flurazepam, lorazepam, midazolam, nitrazepam, nordiazepam, oxazepam, phenazepam, temazepam.
- Control test mix

- Lipomed or Cayman, 5 µg/mL each of the following drugs:
  - 6-monoacetylmorphine, acetyl fentanyl, acetyl norfentanyl, buprenorphine, codeine, dextromethorphan, dihydrocodeine, EDDP, fentanyl, hydrocodone, hydromorphone, meperidine, meprobamate, methadone, morphine, naloxone, naltrexone, norbuprenorphine, norfentanyl, normeperidine, norpropoxyphene, oxycodone, oxymorphone, propoxyphene, sufentanil, tramadol, amphetamine, benzoylecgonine, carisoprodol, cocaine, cyclobenzaprine, MDA, MDEA, MDMA, methamphetamine, phencyclidine, phentermine, 7-aminoclonazepam, alpha-hydroxyalprazolam, alprazolam, clonazepam, diazepam, flunitrazepam, flurazepam, lorazepam, midazolam, nitrazepam, nordiazepam, oxazepam, phenazepam, temazepam.
  - 
  - Internal standard mix
    - Cerilliant, Lipomed, or Cayman, 100 ng/mL each of the following drugs:
      - 6-monoacetylmorphine-D6, acetyl fentanyl-D5, acetyl norfentanyl-D5, buprenorphine-D4, codeine-D6, dextromethorphan-D3, dihydrocodeine-D6, EDDP-D3, fentanyl-D5, hydrocodone-D6, hydromorphone-D3, meperidine-D4, meprobamate-D7, methadone-D9, morphine-D3, naloxone-D5, naltrexone-D3, norbuprenorphine-D3, norfentanyl-D5, normeperidine-D4, norpropoxyphene-D5, oxycodone-D6, oxymorphone-D3, propoxyphene-D5, sufentanil-D5, tramadol-13C-D3, amphetamine-D11, benzoylecgonine-D3, carisoprodol-D7, cocaine-D3, cyclobenzaprine-D3, MDA-D5, MDEA-D5, MDMA-D5, methamphetamine-D5, phencyclidine-D5, phentermine-D5, 7-aminoclonazepam-D4, alpha-hydroxyalprazolam-D5, alprazolam-D5, clonazepam-D4, diazepam-D5, flunitrazepam-D3, lorazepam-D4, midazolam-D4, nitrazepam-D5, nordiazepam-D5, oxazepam-D5, phenazepam-D4, temazepam-D5.

### Equipment

- Micropipettes and tips
- Benchtop vortex mixer
- Eppendorf 96-well plate shaker
- Zephyr
- TurboVap 96-well plate concentration workstation
- TurboVap LV concentration workstation
- Eppendorf heat sealer
- 16×100 mm tubes

### Instrumentation

- AB SCIEX 4000 Q TRAP LC/MS/MS system
- Kinetex™ 2.6 µm Phenyl-Hexyl 100 Å, LC Column 50×4.6 mm (Phenomenex part 00B-4495-E0, or equivalent)
- SecurityGuard™ ULTRA cartridges for Phenyl UHPLC (Phenomenex part AJ0-8774, or equivalent)

LC Instrument conditions

Injection volume: 5 µL

Column oven: 30 °C

Time (min)	Flow Rate (µL/min)	A%	B%
0.00	800	95	5
4.00	800	0	100
5.00	800	0	100
5.1	800	95	5
7	800	95	5

Analyte	Range	LOD	LOQ	Parent	Quant	Qual
6-Acetylmorphine	5-120	5	5	328.336	152.03	165.043
<b>6-Acetylmorphine-D6</b>	-	-	-	334.358	165.02	-
7-Aminoclonazepam	1-120	1	1	286.08	222.10	121.057
<b>7-Aminoclonazepam-D4</b>	-	-	-	290.211	226.12	-
Acetyl Fentanyl	0.5-10	0.5	0.5	323.317	104.98	188.069
<b>Acetyl Fentanyl-D5</b>	-	-	-	328.328	104.97	-
Acetyl Norfentanyl	0.3-12	0.3	0.3	219.204	136.05	84.123
<b>Acetyl Norfentanyl-D5</b>	-	-	-	224.207	84.05	-
Alprazolam	5-100	5	5	309.267	205.07	281.101
<b>Alprazolam-D5</b>	-	-	-	330.232	302.14	-
Amphetamine	2.5-120	2.5	2.5	136.218	119.17	91.082
<b>Amphetamine-D11</b>	-	-	-	147.207	98.13	-
Benzoylcegonine	10-120	10	10	209.176	168.07	77.011
<b>Benzoylcegonine-D3</b>	-	-	-	293.289	171.12	-
Buprenorphine	1-120	1	1	468.319	396.10	414.236
<b>Buprenorphine-D4</b>	-	-	-	472.331	59.08	-
Carisoprodol	1-120	1	1	261.24	55.15	176.23
<b>Carisoprodol-D7</b>	-	-	-	268.354	183.15	-
Clonazepam	1-120	1	1	316.156	270.00	151.009
<b>Clonazepam-D4</b>	-	-	-	320.22	274.11	-
Cocaine	10-120	10	10	304.238	77.07	18.193
<b>Cocaine-D3</b>	-	-	-	307.21	185.18	-
Codeine	5-150	1	1	300.2	114.92	198.919
<b>Codeine-D6</b>	-	-	-	306.242	152.08	-
Dextromethorphan	5-100	5	5	272.154	170.95	127.928
<b>Dextromethorphan-D3</b>	-	-	-	275.266	171.07	-
Diazepam	2.5-120	2.5	2.5	285.18	153.99	193.013
<b>Diazepam-D5</b>	-	-	-	290.208	198.12	-
Dihydrocodeine	5-100	5	5	302.172	114.94	198.928
<b>Dihydrocodeine-D6</b>	-	-	-	308.205	128.09	-
Fentanyl	5-150	5	5	337.332	105.06	188.154

<b>Fentanyl-D5</b>	-	-	-	342.388	188.01	-
Flunitrazepam	2.5-120	2.5	2.5	341.25	368.20	239.094
<b>Flunitrazepam-D3</b>	-	-	-	317.247	271.19	-
Hydrocodone	1-120	1	1	300.188	127.93	198.919
<b>Hydrocodone-D6</b>	-	-	-	306.296	202.04	-
Hydromorphone	1-120	1	1	286	127.96	184.988
<b>Hydromorphone-D3</b>	-	-	-	289.17	184.99	-
Lorazepam	2.5-120	2.5	2.5	322.077	229.93	303.95
<b>Lorazepam-D4</b>	-	-	-	327.022	281.20	-
MDA	2.5-120	2.5	2.5	180.243	105.09	163.086
<b>MDA-D5</b>	-	-	-	185.288	168.14	-
MDEA	5-100	5	5	208.199	105.00	162.983
<b>MDEA-D5</b>	-	-	-	213.242	163.07	-
MDMA	5-100	5	5	194.221	105.12	163.16
<b>MDMA-D5</b>	-	-	-	199.204	165.09	-
Meperidine	5-100	5	5	248.116	174.13	220.091
<b>Meperidine-D4</b>	-	-	-	252.172	178.09	-
Meprobamate	5-100	5	5	219.127	97.06	158.062
<b>Meprobamate-D7</b>	-	-	-	226.165	165.14	-
Methadone	5-120	1	1	210.274	104.97	265.114
<b>Methadone-D9</b>	-	-	-	319.407	268.29	-
Methamphetamine	10-120	10	10	150.196	119.01	90.992
<b>Methamphetamine-D5</b>	-	-	-	155.191	91.98	-
Midazolam	1-120	1	1	326.247	249.14	291.129
<b>Midazolam-D4</b>	-	-	-	330.233	295.19	-
Morphine	1-120	1	1	286.126	151.96	127.962
<b>Morphine-D3</b>	-	-	-	289.269	152.03	-
Naloxone	2.5-120	1	1	328.313	212.00	310.112
<b>Naloxone-D5</b>	-	-	-	33.334	315.13	-
Naltrexone	1-120	1	1	342.271	55.09	324.162
<b>Naltrexone-D3</b>	-	-	-	345.293	327.16	-
Nitrazepam	5.0-50.0	5	5	282.17	235.98	179.992
<b>Nitrazepam-D5</b>	-	-	-	287.255	241.18	-
Norbuprenorphine	1-120	1	1	414.34	83.17	55.169
<b>Norbuprenorphine-D3</b>	-	-	-	417-418	55.08	-
Nordiazepam	1-120	1	1	271.134	140.07	165.015
<b>Nordiazepam-D5</b>	-	-	-	276.242	140.04	-
Norfentanyl	5-100	5	5	233.163	55.07	84.062
<b>Norfentanyl-D5</b>	-	-	-	238.164	84.09	-
Oxazepam	1-120	1	1	287	104.00	269
<b>Oxazepam-D5</b>	-	-	-	292.26	246.17	-
Oxycodone	5-120	5	5	316.155	241.01	298.025

<b>Oxycodone-D6</b>	-	-	-	322.209	304.21	-
Oxymorphone	2.5-120	1	1	302.225	384.23	224.132
<b>Oxymorphone-D3</b>	-	-	-	305.327	287.11	-
PCP	2.5-120	2.5	2.5	244.143	91.00	86.11
<b>PCP-D5</b>	-	-	-	249.248	86.14	-
Phenazepam	1-120	1	1	351.125	104.02	206.026
<b>Phenazepam-D4</b>	-	-	-	355.235	209.97	-
Phentermine	2.5-120	2.5	2.5	150.204	133.15	91.06
<b>Phentermine-D5</b>	-	-	-	155.148	95.99	-
Propoxyphene	5-120	5	5	340.399	266.10	58.11
<b>Propoxyphene-D5</b>	-	-	-	345.439	58.11	-
Sufentanil	0.5-15	0.5	0.5	387.273	11.01	238.163
<b>Sufentanil-D5</b>	-	-	-	392.359	238.08	-
Temazepam	2.5-120	2.5	2.5	301.266	255.11	283.1
<b>Temazepam-D5</b>	-	-	-	307.384	264.09	-
Tramadol	5-150	5	5	264.153	42.07	58.1
<b>Tramadol-13C-d3</b>	-	-	-	268.159	58.10	-
$\alpha$ -Hydroxyalprazolam	1-120	1	1	325.245	297.13	216.05
<b><math>\alpha</math>-Hydroxyalprazolam-D5</b>	-	-	-	330.232	302.14	-

## MS Acquisition Parameters:

<b>Acquisition method</b>	<b>Benzodiazepines</b>	<b>Opiates</b>	<b>Drugs of Abuse</b>
Sync mode	LC sync	LC sync	LC sync
Auto-equilibration	Off	Off	Off
Acquisition time	7.007 min	7.007 min	7.007 min
Number of periods	1	1	1
Scans per period	2102	2102	2102
Scan type	sMRM	sMRM	sMRM
Ion source	Turbo spray	Turbo spray	Turbo spray
MRM detection window	60 sec	30 sec	30 sec
Target scan time	0.2000 sec	0.2000 sec	0.2000 sec
Resolution (Q1)	Unit	Unit	Unit
Resolution (Q3)	Unit	Unit	Unit
Intensity threshold	0.00 cps	0.00 cps	0.00 cps
Settling time	0.000 msec	0.000 msec	0.000 msec
MR pause	5.0070 msec	5.0070 msec	5.0070 msec
MCA	No	No	No
Step size	0.00 Da	0.00 Da	0.00 Da

**Procedure**

1. Turn on TurboVap and set at 35 °C. Turn on the shaking incubator and set at 30 °C.
2. Allow refrigerated specimens to reach ambient temperature.

3. Prepare calibration standards using LC Calibrator Test Mix as described below. Prepare four controls at 2.5 ng/mL, 10 ng/mL, 50 ng/mL, and 100 ng/mL using LC Control Test Mix as described below.
4. Place the plate in TurboVap, and dry it down under a gentle flow of nitrogen.
5. Note: Steps 5-14 can be performed using either the Zephyr Liquid Handling System or manually.
  - a. *For Zephyr:* To this plate, add approximately 1 mL of blank blood to each well corresponding to the location of a calibrator or control. For each sample, add approximately 1 mL of blood and 1 mL of diluted blood to a well containing only internal standard.
  - b. *If manual:* To this plate, add approximately 0.5 mL of blank blood to each well corresponding to the location of a calibrator or control. For each sample, add approximately 0.5 mL of blood and 0.5 mL of diluted blood to a well containing only internal standard.
6. Place the plate on the shaking incubator at approximately 600 rpm for approximately eighteen minutes.
7. Remove the plate and reset the temperature on the shaking incubator to 37 °C.
8. Add 0.5 mL of 0.5 M ammonium hydroxide to all wells. Mix several times via aspiration/dispensing.
9. Place plate on the shaking incubator at approximately 600 rpm for approximately ten minutes.
10. Transfer 300 µL of each well to the corresponding well of a SLE+ plate.
11. Apply vacuum until the solution penetrates the well sorbent approximately halfway (or until no liquid remains on top of sorbent). This should take approximately four seconds.
12. Wait five minutes for the sample to completely absorb.
13. Add 900 µL ethyl acetate and allow to flow for five minutes under gravity.
14. If necessary, apply vacuum to complete elution.
15. Repeat steps 12 & 13 for the second elution fraction.
16. Evaporate to dryness in the TurboVap at approximately 45 °C under a constant flow of nitrogen (normally 10-15 units).
17. Reconstitute each sample with 100 µL methanol. Heat-seal the plate with foil to prevent evaporation.
18. Analyze all samples immediately or refrigerate at 4 °C.

### **Quality Assurance, Interpretation, Precautions, and Notes**

This analytical technique does not produce a diagnostic mass spectrum (like that typical of EI GC-MS), so a different type of assessment is necessary to determine whether a targeted analyte is present. In order to report a “positive” result, the following criteria must be met:

#### **Calibrators:**

Up to eleven calibrators will be analyzed to set the linear range of the method. These calibrators will be prepared in the appropriate matrix using certified reference materials (CRMs), whenever available. The concentrations of these calibrators will vary by analyte, with the expected working range listed in the validation document for each analyte. Calibrators outside of the validated working range may not be included in the assay. The

use of calibrated analytical balances, pipettes, and class A volumetric glassware, as appropriate, is required for calibrator preparation.

The calibration curve must meet the requirements outlined in § 5.4.3.6.3, *Calibration Curves*.

**Controls:**

The concentration of the positive controls will vary by analyte, depending upon the expected working range of the assay for that analyte. Typically, four positive control concentrations will be analyzed to evaluate the working range. The CRM used to prepare the positive control must be from a different source than the CRM used to prepare the calibrators. Each positive control must fall within 20% of its target value (30% for the concentration of the lowest calibrator) and be within the working range of the calibration curve.

A negative control will be extracted (containing only internal standard) to demonstrate the absence of any contaminant which would result in a false positive response. The targeted analyte must not be detected (i.e., reportable) in the negative control.

**Specimens:**

Two aliquots of each case specimen are typically run, if sample amount permits: one neat and one diluted. The quantitative results of any two aliquots of the same specimen may not deviate more than 20% from their mean. Dilutions of the case specimen may include a 1:10 and/or 1:100 dilution depending on the analyte. Dilutions are made using sheep blood—no other diluent may be used to dilute the specimen.

**Signal-to-Noise Ratio (S:N):**

The signal-to-noise ratio for each transition must be greater than 10:1. If no background noise exists for a given transition, then this requirement is considered to be met.

**Retention Time:**

The retention time must be within  $\pm 2\%$  of the expected relative retention time, which is established by certified reference material. It is defined as the quotient of the retention time of the analyte and of the internal standard. An exception will be made for analytes that do not have an isotopically-labeled internal standard. The expected relative retention time is set in the instrument method, but may be evaluated on a batch-by-batch basis.

**Other notes and requirements:**

The qualitative presence of each analyte is determined by the evaluation of the Q1 and Q2 transitions, the signal to noise (S:N), and the relative retention time (RRT) for each analyte.

Sample plates may be stored for up to three days after extraction, if stored refrigerated at 4 °C. Carryover is monitored by running a solvent blank between case specimens. Positive results in injections following samples containing high amounts of analyte are evaluated on a case-by-case basis, and may require re-extraction or reanalysis before reporting.

The performance of calibrators and controls is evaluated by a second analyst, and a record of this evaluation is recorded on a batch worksheet and maintained in the case record.

### Preparation of Materials:

#### *LC Eluent "A"*

0.613 grams of ammonium formate is added to a 1 L class A volumetric flask, and brought to volume with ultrapure water. This solution expires after one week.

#### *LC Eluent "B"*

1 mL of formic acid is added to a 1 L class A volumetric flask and brought to volume with methanol. This solution expires after one week.

#### *0.5 M Ammonium Hydroxide*

33.57 mL of concentrated stock (28-30 % w/w) ammonium hydroxide is added to a 500 mL class A volumetric flask and brought to volume with ultrapure water. This solution expires after one week.

#### *Stock Calibrator Mix*

A 5 µg/mL stock calibrator mix solution is prepared. The following drugs are added into a 50 mL class A volumetric flask and brought to volume with acetonitrile:

Compound	[C]	Spike Amount (µL)
6-acetylmorphine	1 mg/mL	25
7-aminoclonazepam	1 mg/mL	25
acetyl fentanyl	100 µg/mL	250
acetyl norfentanyl	100 µg/mL	250
alprazolam	1 mg/mL	25
amphetamine	1 mg/mL	25
benzoylecgonine	1 mg/mL	25
buprenorphine	1 mg/mL	25
carisoprodol	1 mg/mL	25
clonazepam	1 mg/mL	25
cocaine	1 mg/mL	25
codeine	1 mg/mL	25
cyclobenzaprine	1 mg/mL	25
dextromethorphan	1 mg/mL	25
diazepam	1 mg/mL	25
dihydrocodeine	1 mg/mL	25
EDDP	1 mg/mL	25
fentanyl	1 mg/mL	25
flunitrazepam	1 mg/mL	25

flurazepam	1 mg/mL	25
heroin	1 mg/mL	25
hydrocodone	1 mg/mL	25
hydromorphone	1 mg/mL	25
hydroxyalprazolam	1 mg/mL	25
lorazepam	1 mg/mL	25
MDA	1 mg/mL	25
MDEA	1 mg/mL	25
MDMA	1 mg/mL	25
meperidine	1 mg/mL	25
meprobamate	1 mg/mL	25
methadone	1 mg/mL	25
methamphetamine	1 mg/mL	25
midazolam	1 mg/mL	25
morphine	1 mg/mL	25
naloxone	1 mg/mL	25
naltrexone	1 mg/mL	25
nitrazepam	1 mg/mL	25
norbuprenorphine	1 mg/mL	25
nordiazepam	1 mg/mL	25
norfentanyl	1 mg/mL	25
normeperidine	1 mg/mL	25
norpropoxyphene	1 mg/mL	25
oxazepam	1 mg/mL	25
oxycodone	1 mg/mL	25
oxymorphone	1 mg/mL	25
PCP	1 mg/mL	25
phenazepam	1 mg/mL	25
phentermine	1 mg/mL	25
propoxyphene	1 mg/mL	25
sufentanil	100 µg/mL	250
temazepam	1 mg/mL	25
tramadol	1 mg/mL	25

Three working calibrator (*Cerilliant*) and control (*Lipomed* or *Cayman*) mixes, labeled as "A", "B", and "C" below, are prepared for use in the standard curve.

*LC Calibrator Mix A: 500 ng/mL*

Add 1 mL of corresponding stock calibrator mix to 10 mL volumetric flask. Bring to volume with acetonitrile.

**LC Calibrator Mix B: 50 ng/mL**

Add 1 mL LC Calibrator Mix A to 10 mL volumetric flask. Bring to volume with acetonitrile.

**LC Calibrator Mix C: 5 ng/mL**

Add 1 mL LC Calibrator Mix B to 10 mL volumetric flask. Bring to volume with acetonitrile.

**Stock Control Mix**

A 5 µg/mL stock control mix solution is prepared in the same manner as the calibrator mix.

**Calibrator Preparation**

Calibrator	Final [C] (ng/mL) <sup>1</sup>	Added volume (µL)	Stock Solution
1	1.0	100	Std. C (5 ng/mL)
2	2.5	25	
3	5.0	50	
4	10	100	
5	25	25	Std. B (50 ng/mL)
6	40	40	
7	50	50	
8	75	75	
9	100	100	
10	120	120	
11	150	150	
			Std. A (500 ng/mL)

**5.5****Control Preparation**

Control	Final [C] (ng/mL) <sup>2</sup>	Added volume (µL)	Stock Solution
1	2.5	25	Std. B (50 ng/mL)
2	10	100	
3	50	50	Std. A (500 ng/mL)
4	100	100	

**Preparation of Internal Standard Solution**

Add the listed internal standards to a 50 mL volumetric flask, and bring to volume with HPLC grade methanol.

**Preparation of Internal Standard Spiking Solution**

Compound	[C]	Added Volume (µL)
6-acetylmorphine-D6	1 mg/mL	25

<sup>1</sup> Made up to 500 ng/mL with sheep blood.

<sup>2</sup> Made up to 500 ng/mL with sheep blood.

7-aminoclonazepam-D4	1 mg/mL	25
acetyl fentanyl-D5	100 µg/mL	500
acetyl norfentanyl-D5	100 µg/mL	500
alprazolam-D5	1 mg/mL	25
amphetamine-D11	1 mg/mL	25
benzoylecgonine-D3	1 mg/mL	25
buprenorphine-D4	1 mg/mL	25
carisoprodol-D7	1 mg/mL	25
clonazepam-D4	1 mg/mL	25
cocaine-D3	1 mg/mL	25
codeine-D6	1 mg/mL	50
cyclobenzaprine-D3	100 µg/mL	250
dextromethorphan-D3	100 µg/mL	250
diazepam-D5	1 mg/mL	25
dihydrocodeine-D6	1 mg/mL	50
EDDP-D3	1 mg/mL	25
fentanyl-D5	1 mg/mL	25
flunitrazepam-D3	1 mg/mL	25
heroin-D9	1 mg/mL	75
hydrocodone-D6	1 mg/mL	25
hydromorphone-D3	1 mg/mL	50
hydroxyalprazolam-D5	1 mg/mL	25
lorazepam-D4	1 mg/mL	75
MDA-D5	1 mg/mL	25
MDEA-D5	1 mg/mL	25
MDMA-D5	1 mg/mL	25
meperidine-D4	1 mg/mL	25
meprobamate-D7	1 mg/mL	25
methadone-D9	1 mg/mL	25
methamphetamine-D5	1 mg/mL	25
midazolam-D4	100 µg/mL	250
morphine-D3	1 mg/mL	75
naloxone-D5	100 µg/mL	250
naltrexone-D3	100 µg/mL	250
nitrazepam-D5	100 µg/mL	250
norbuprenorphine-D3	1 mg/mL	50

nordiazepam-D5	1 mg/mL	25
norfentanyl-D5	1 mg/mL	25
normeperidine-D4	1 mg/mL	25
norpropoxyphene-D5	1 mg/mL	50
oxazepam-D5	1 mg/mL	25
oxycodone-D6	1 mg/mL	25
oxymorphone-D3	1 mg/mL	25
PCP-D5	1 mg/mL	25
phenazepam-D4	100 µg/mL	500
phentermine-D5	100 µg/mL	250
propoxyphene-D5	1 mg/mL	25
sufentanil-D5	100 µg/mL	250
temazepam-D5	1 mg/mL	50
tramadol- <sup>13</sup> C-D3	1 mg/mL	25



To calculate the reporting range, the reported drug quantitation result will be multiplied by the estimate of the uncertainty of measurement and the result rounded up at the second significant figure.

#### **5.5.1.3 Carboxyhemoglobin quantitation**

Carboxyhemoglobin saturations will be reported with an estimate of the uncertainty of measurement. This has been determined to be an absolute 4% saturation, not relative to the reported carboxyhemoglobin saturation. This precludes the need for any calculations when reporting a carboxyhemoglobin result.

## **5.6 EQUIPMENT**

The instruments and equipment in the Forensic Toxicology Section will be routinely maintained by the section employees when possible. Major repairs may be performed by a service engineer, preferably from the original equipment manufacturer.

Before a new instrument is first placed into service, a performance verification will be performed to ensure that the instrument is fit for use with the appropriate method. Positive and negative controls and/or calibrators are sufficient for this purpose. The documentation (or a reference to its location) will be maintained in the maintenance log for that instrument.

If new equipment requires a validation, the personnel must be trained before they can use the instrument in casework. This training will be documented in the appropriate Employee History Binder.

A maintenance log is located by each instrument to contain a record of all routine and non-routine maintenance performed on that instrument. It must contain a description of the maintenance, the date the maintenance was performed, and the identity of the person(s) performing the maintenance. It also records the method by which it is verified that the instrument is in proper working order. If this is by the analysis of controls, then the location of those controls must be specified.

Designated instruments require the maintenance of a QC logbook which includes the following:

- Outline of normal operating parameters (e.g. oven program, gas flow rate)
- Record of all calibration and quality control checks
- Record of all maintenance performed on the instrument

If an instrument is removed from service pending repair, a record of the repair and of the proper functioning of the instrument must be made before the instrument is placed back in service.

The requirements for maintenance vary according to instrument type. The general requirements are:

### **5.6.1 Gas Chromatographs (GCs)**

The septum and injection liner should be replaced weekly, or as needed. Any decrease in the quality of the chromatography should be noted and appropriate documented action taken to correct the problem.

The solvent wash bottles should be rinsed and filled with the appropriate solvent as needed. The waste bottles should be rinsed and emptied into waste containers.

### **5.6.2 Gas Chromatographs-Mass Spectrometers (GC-MSs)**

The gas chromatograph portion of this instrument is maintained as listed above.

The GC-MS will be auto-tuned at least weekly, if used, and should be tuned before each sequence is run. The GC-MS will be auto-tuned prior to running a selected ion monitoring

(SIM) method. All tune reports should be maintained in a logbook. The autotune uses the 69, 219, and 502 m/z produced by the calibration compound PFTBA to optimize various parameters for the Mass Selective Detector. After the autotune report has printed, the chemist will assess the calibration by examining the autotune report for the following items:

- If the abundance of any peak(s) below 69 m/z (e.g. 18[water], 28[nitrogen], 32[oxygen]) are >20%, relative to the abundance of the 69 m/z peak. The water peak at m/z 18 must be less than 10%, and is optimally much less than 5%. Any significant peak at m/z 28 is indicative of a nitrogen contamination from a leak or from a contaminated gas cylinder
- If the EM voltage is greater than 2500

If either of these conditions exist, the instrument is not in proper working condition and will be removed from service until it has been repaired and has passed calibration. A record of the remediation and proper functioning of the instrument, usually in the form of a successful tune, must be recorded.

If the tune report indicates that the tune is acceptable, the analyst checking the tune report will initial the tune report, or index it into the LIMS.

Other maintenance is performed on an as-needed basis. When the GC-MS has been removed from service to clean the source or replace the filaments, maintenance should be performed on the following items, as needed:

- The source should be cleaned following manufacturer-recommended procedures
- The filaments should be replaced
- The diffusion pump oil should be inspected and replaced if necessary
- The fore-line pump oil should be checked and filled or replaced if necessary
- The vent line should be rinsed with methanol
- The vent line trap should be inspected and replaced if necessary
- The gold seal should be inspected and replaced if necessary

### 5.6.3 Liquid Chromatographs-Mass Spectrometers (LC-MSs)

The guard column filter should be changed routinely, typically after approximately one-hundred injections of a biological extract.

The LC-MS will be tuned when necessary, typically during a preventive maintenance visit or when the tune drifts more than 0.4 Daltons (as judged by the components of a positive control mix).

### 5.6.4 UV-Visible Spectrophotometer

UV-Vis uses positive control samples supplied by IL Instrumentation Laboratory to ensure that the instrument is responding properly. These analytical results from these controls must fall within a range of values supplied with the control samples. A positive control and negative control (consisting of blank blood) is run with each batch of casework.

### 5.6.5 Indiko Plus

The Indiko Plus is maintained according to the manufacturer's specifications. Maintenance

is performed monthly, weekly, and daily (if used). Control samples are run daily (if used) to ensure that the instrument is responding within specifications. Any significant repair should be performed by a company representative.

#### **5.6.6 Balances**

The calibration of each balance will be checked daily (if used) with traceable standards before any measurements are made. If the calibration is off then the balance must be adjusted. The acceptability range for an analytical balance using a 100 gram calibration mass is 99.9998-100.0002 grams. The acceptability range for a top loading balance using a 100 gram calibration mass is 99.9-100.1 grams. The procedure for adjustment will vary from balance to balance.

#### **5.6.7 Pipettes**

Micropipette calibration will be checked each calendar year, and the micropipettes recalibrated and/or repaired, if necessary. Calibration services are provided by an outside vendor.

## **5.7 MEASUREMENT TRACEABILITY**

The Forensic Toxicology Section complies with the lab-wide policy regarding measurement traceability.

The Forensic Toxicology Section maintains measurement traceability on all equipment that has a significant effect on the accuracy or validity of the result of the test.

### **5.7.1 Reference Standards**

The Forensic Toxicology Section maintains a 100 gram NIST-certified reference mass standard for use in performance adjustments to its balances. This reference standard will be calibrated or replaced every five years.

Micropipettes are calibrated at least once per calendar year by an authorized external calibration service provider.

Micropipettes and balances used for critical measurements (i.e., measurements which can have a significant effect on a reported result) are specifically identified in the case record, typically through the use of a batch worksheet and/or results worksheet.

### **5.7.2 Reference Materials**

The Forensic Toxicology Section purchases certified reference materials from companies which provide a certificate of analysis. These certificates of analysis are maintained on the shared Toxicology network drive. Materials for which no certificate of analysis is provided must be verified before use. Reference materials for which the expiration date has passed must be reverified before use (e.g., through comparison to a calibration curve, mass spectral analysis, infrared analysis).

Certified reference materials used in critical measurements (i.e., measurements which can have a significant effect on a reported result) are specifically identified in the case record, typically through the use of a batch worksheet and/or results worksheet.

### **5.7.3 Reference Databases**

Mass spectral and other libraries used to identify unknown compounds will be well-accepted in the field and uniquely identified.

## **5.8 SAMPLING**

The Forensic Toxicology Section complies with the lab-wide policy regarding sampling.

There is an assumption of homogeneity in toxicology specimens which obviates the requirement for a sampling plan or a sample selection policy. Nonetheless, actions are taken in routine casework to ensure that this assumption is valid. Specimens which may separate (e.g., blood) are inverted to ensure that the specimen is homogeneous.

## **5.9 HANDLING OF TEST ITEMS**

The Forensic Toxicology Section complies with the lab-wide policy regarding the handling of test items.

The disposition of all evidence in the Arkansas State Crime Laboratory is recorded by a chain of custody. This chain of custody is primarily electronic, but may have written components which are stored in the appropriate case record. The chain of custody records the following information for each transfer of evidence:

- The date and time of the transfer
- The person/location/disposition from which the evidence is being transferred
- The person/location/disposition to which the evidence is being transferred
- An indication of the verification of the security of the transfer, which may be a signature on a written chain of custody, or an indication of verification by password if on an electronic chain of custody

The LIMS (Laboratory Information Management System) program is normally used to track all transfers of evidence between analysts and other personnel or storage locations.

### **5.9.1 Accession of Evidence**

Evidence submitted for toxicological analysis is submitted by an outside agency or by the medical examiner's office. Evidence is accessioned into the Forensic Toxicology Section in one of two ways: it is brought directly to the Forensic Toxicology Section from the Medical Examiner's Office, or it is received from the Evidence Receiving Section.

When evidence is brought directly to the Forensic Toxicology Section from the medical examiner's office, it must be accepted by a Forensic Toxicologist or other person allowed to transfer evidence within the Forensic Toxicology Section. The process is as follows:

- The specimens are brought to the Forensic Toxicology Section
- The specimens are transferred from the submitter to the Forensic Toxicology Section secure storage using the LIMS
- Each item of evidence is sealed with tape (if initially unsealed)
- The specimens are placed in refrigerated storage

When evidence is transferred from the Evidence Receiving Section the following process occurs:

- An Evidence Receiving Technician retrieves the appropriate specimens from secure storage
- The specimens are transferred from the Evidence Receiving Technician to a section representative using the LIMS
- The specimens are transported to the Forensic Toxicology Section and stored in refrigerated storage

### **5.9.2 Sub-itemization**

Toxicology evidence is routinely subdivided into individual evidence items which are assigned unique identifiers and tracked separately using the chain of custody accessible

through the LIMS.

Because toxicology specimens are not returned to the submitting agency, or produced in court, the original packaging is routinely destroyed. A description of this packaging must be maintained in the case file, including whether it was found in a sealed state, a description of the marking(s) on the packaging, and any other useful information.

Accession (documentation of packaging and sub-itemization) is considered the beginning of analysis for evidence in the Toxicology Section.

### **5.9.3 Storage**

Evidence is stored in refrigerated storage inside a locked walk-in refrigerator or inside a locked freezer while awaiting analysis. These common storage areas are available only to the members of the Forensic Toxicology Section and other authorized personnel. All evidence in storage must be maintained in a sealed state unless it is in the process of examination, during which time it may remain unsealed. Once a case is completed, all unsealed items of evidence from that case must be resealed.

A record of the temperature conditions for all storage locations within the section will be maintained. Refrigerated storage for evidence should be kept between -1° C and 3° C. Refrigerated storage for chemicals should be kept between 2° C and 8° C. Frozen storage should be kept at or below 0° C. If the storage conditions deviate from that range for an extended time period (i.e., more than one day) then the cause will be assessed and any necessary action taken.

Evidence for a particular case can be retained indefinitely if indicated (e.g., further testing may be needed, there may be a request for external testing, etc.). Specimens will also be retained indefinitely upon court order. Specimens may also be transferred to the submitting agency for long term storage.

### **5.9.4 Disposal**

As cases are completed the specimens associated with these completed cases are resealed with tape and placed in storage boxes to await disposal. Homicide cases are stored separately from other cases. The procedure for boxing these samples is as follows:

- Transfer the case from the possession of the analyst or the Forensic Toxicology Section to the possession of a named box. This information will be recorded in the chain of custody, normally using a batch transfer in the LIMS.
- When the box is filled, the box is sealed and the date that the last case was put in the box is recorded. The date of the last transfer for items in the box is also available in the LIMS database.

After six months, the specimens from non-homicide cases may be destroyed if no request for retention or further testing has been received. Homicide cases are stored indefinitely and are not routinely destroyed. The chain of custody serves as a record of all specimens destroyed. It lists the identity of each specimen, the date it was destroyed, and the identity of the person destroying the specimen. Specimens are disposed of as biomedical waste to an approved contractor or in another accepted manner.

### 5.9.5 Release of Evidence Items

Specimens can be released to the submitting agency if requested by that agency. Specimens submitted by the medical examiner's office may be returned to them directly using the internal chain of custody system. Release to anyone other than, or by the direction of, the submitting agency requires a court order. All releases to outside agencies will be documented in the case record.

Specimens sent for outside testing may be retained and/or destroyed by the outside testing agency. These specimens are not considered released by the laboratory, but rather consumed as a result of analysis.

### 5.9.6 Cessation of Analysis

The Forensic Toxicology Section may discontinue further forensic examinations when the toxicological results support the maximum charge to be filed, or if further testing is otherwise inappropriate.

### 5.9.7 Cases Inappropriate for Analysis

Certain types of cases are inappropriate for analysis and will not routinely be analyzed. Examples include, but are not limited to:

- Law enforcement cases where the toxicological analysis is not probative to criminal charges, such as:
  - Cases where toxicology results are being requested to attempt associate a subject with the possession or manufacture of a controlled substance
  - Testing of a third party to a crime (such as a passenger in a DWI vehicle)
  - Cases submitted for informational purposes only, such as cases with no charges
- Cases where the sample submitted is unsuitable for testing due to type or amount
- Cases where the specimens have leaked from the container or may otherwise have been subject to contamination
- Evidence items not consisting of biological specimens, such as possibly-adulterated food or drink

Exceptions may be made to this policy when testing may be appropriate.

### 5.9.8 Evidence Marking and Sealing

All evidence will be marked or identified with the unique laboratory case number, if practical (e.g. YYYY-##### or YYYY-#####). Otherwise the proximal container must be marked or identified with the unique laboratory case number. Each exterior container must have its appropriate barcode label affixed to it.

Evidence will be sealed in a manner in which the contents cannot readily escape and in such a manner that opening the container would result in obvious damage or alteration to the container or its tape seal (if present).

### 5.9.9 Inter-laboratory Evidence Transfer

Section policies regarding inter-laboratory evidence transfer conform to the lab-wide policies and may be found in the *ASCL Quality Manual* (ASCL-DOC-001).

## **5.10 ASSURING THE QUALITY OF TEST AND CALIBRATION RESULTS**

The Forensic Toxicology Section uses the quality system outlined in this document to monitor and ensure the quality of its results. Quality control data is used to evaluate the performance of methods and instruments, and to identify any trends. Among the policies and procedures which help to ensure high quality test results are:

- The use of certified and/or verified reference materials
- The use of positive and negative controls wherever appropriate
- Full administrative and technical review
- Competency testing of all analysts before they assume casework responsibilities
- Annual proficiency testing in each category of analysis
- Use of multiple analytical techniques to confirm positive results
- Use of multiple replicates to confirm quantitative values
- Annual testimony monitoring, when available

### **5.10.1 Proficiency Testing**

The Forensic Toxicology Section policies regarding proficiency testing conform to the lab-wide policies and may be found in the lab-wide quality manual. Additions and clarifications to the lab-wide policies are listed here.

Each analyst will be proficiency tested at least annually. Each analyst will be tested at least once in each category of testing in which they perform casework during every five-year period. In the Forensic Toxicology Section these categories are:

- Human Performance Forensic Toxicology
- Post-mortem Forensic Toxicology

The Forensic Toxicology Section will complete an external proficiency test from an ASCLD/LAB approved provider in each of these categories of testing annually. The list of approved tests and providers can be obtained from ASCLD/LAB.

Proficiency tests are run as identically as possible to casework, including technical and peer review. There are two main exceptions to this. First, proficiency test providers may have additional requirements regarding testing and/or reporting that we must follow. Second, proficiencies are not subject to policies put into place for efficiency or expediency of casework. For example, if an immunoassay is positive for a class of compounds, we must attempt to detect all of the members of that class to the extent of our ability even if we would not normally continue to test for members of that class once one had been confirmed.

Proficiency test records will be maintained for at least fifteen years.

In addition to proficiency testing, case re-examination or blind analysis may be performed in the Forensic Toxicology Section. This allows the laboratory to demonstrate that proficiency samples are treated in the same manner as cases.

Case re-examination can be achieved in the Forensic Toxicology Section in one of two ways.

First, a completed case may be reassigned to a second analyst for reanalysis. The first analyst must not have been previously aware that the case will be reanalyzed. Second, duplicate samples may be submitted and analyzed concurrently by two analysts if the two analysts are not aware of the duplicate analysis.

Blind analysis can be achieved by the submission of a sample of known composition. The sample is submitted as a regular case and the analysis must be performed without the analyst being aware that the sample is a blind sample.

### 5.10.2 Sources of Proficiency Tests

Among approved external proficiency test providers are the College of American Pathologists (FTC proficiency) and Collaborative Testing Services. A list of all approved tests from approved providers may be obtained from ASCLD/LAB.

Internal proficiency testing is acceptable if approved external proficiency tests have been completed. The Chief Forensic Toxicologist (or designee) prepares a sample representative of casework. Twice the required amount of specimen is prepared for analysis. Half is given to the analyst and half retained for reanalysis, if necessary. The analyst is told the type of analysis required. After analysis, technical review, and administrative review, the Chief Forensic Toxicologist or section Quality Manager will review and evaluate the case record.

### 5.10.3 Evaluation of Results

External proficiency test providers generally supply an evaluation of the results of their proficiency test. If no evaluation is provided, then the results are evaluated on the basis of acceptability in the field as a whole (typically  $\pm 30\%$  or two standard deviations for drug quantitation and  $\pm 10\%$  or two standard deviations for alcohol quantitation, whichever is greater).

For internal proficiency tests the standard is whether the analytical results are within the expected error for the analysis performed (e.g. within 20% for quantitations).

### 5.10.4 Administrative and Technical Review

All cases will be technically and administratively reviewed prior to the release of the report. No analyst can review their own work product. The review process must confirm that electronic versions of all necessary documentation are in the imaging module of the LIMS. Case reviews are documented on the *Forensic Toxicology Case Review Form* (TOX-FORM-08).

If the reviewer finds a technical or administrative error, they will then document it on the review form and return the case file to the analyst for correction. If the analyst and the reviewer disagree regarding the error, they should attempt to resolve the issue. If they cannot agree on a solution, then they will meet with the Chief Forensic Toxicology or Section Quality Manager for resolution.

All manual calculations (e.g., averaging quantitation results, correcting a quantitation value for a non-standard aliquot) in the case record will be checked by the reviewer.

If a correction is required in the imaged case file, the original uncorrected documentation

must be maintained in the case file, the correction will be added separately (clearly labeled).

Non-conforming work is subject to the laboratory corrective action policies and procedures.

Stat alcohol or carboximetry results may be released to the Office of the Medical Examiner as preliminary lead information before full technical or administrative review is performed. However, these results must later undergo full technical and administrative review and be reported on the report of laboratory analysis.

#### **5.10.5 Testimony Review**

The Forensic Toxicology Section complies with the lab-wide policy regarding testimony review.

Testimony review records will be maintained for at least fifteen years.

## **5.11 REPORTING THE RESULTS**

### **5.11.1 General**

The Forensic Toxicology Section complies with the lab-wide policy regarding reporting analytical results.

### **5.11.2 Reports**

Toxicology testing is not subject to a sampling plan. Homogeneity is assumed within toxicology specimens.

Each result will be listed on the report related to a source (usually a person), a specimen type (when known), and the type of testing that produced the analytical result.

#### **5.11.2.1 General Reporting Requirements**

Analytical results must be clearly associated with the specimen(s) from which they are derived.

The initial results of a stat carboxyhemoglobin (COHb) assay may be reported to the requesting pathologist after the completion of any one test for carboxyhemoglobin. Positive results must be confirmed by a second method if the case history is inconsistent with the obtained result.

Quantitative results which are above the highest calibrator, but within the acceptable error for this point (i.e. 20% for drug assays, 10% for volatiles) may be reported as that value. Results above that must be reported as "greater than" the highest calibrator (or reanalyzed to bring them into the calibration range).

Quantitative results below the lowest calibrator, but within the acceptable error for this point (i.e. 30% for drug assays, 10% for volatiles) may be reported as that value. Results below that must be reported as "less than" the lowest calibrator (or reanalyzed to bring them into the calibration range).

All reported quantitative results must be accompanied by an estimate of the uncertainty of measurement.

When confirmation testing is performed, and a report of initial testing has not been issued, the immunoassay results should be reported unless they are contradicted by the more specific confirmation testing.

If testing for a specific analyte is requested, then that analyte should be addressed on the report. However, this is not necessary if these specific analytes are routinely requested by the submitting agency without regard to the facts of a given case (i.e., a standard list of analytes).

#### **5.11.2.2 Language**

Immunoassay results are reported as "positive" or "negative".

If the results of a general screen are negative this may be reported as "No drugs detected".

If the results of a screen for a particular analyte are negative this may be reported as "Not detected" unless the assay(s) used would not normally detect the specifically targeted analyte, in which case this is disclaimed on the report.

If drugs are detected in an acid or base screen but not detected in a second aliquot, then those results are not reported.

Although the number of reported significant figures is typically two, this is a matter of professional judgment and is at the discretion of the analyst.

### 5.11.2.3 Disclaimers

A disclaimer may be necessary to clearly define the meaning and limitations of toxicological testing. The following is a list of situations where a disclaimer may be appropriate and a standard disclaimer that may be used. Other situations may require different disclaimers. A disclaimer must be used when appropriate.

If at least one standard-sized aliquot is used in the quantitation of a given drug, then no disclaimer is required for that drug if smaller aliquots are used for corroboration of the quantitative amount.

Situation	Disclaimer
Initial quantitative values are uncorroborated for any reason	The reported drug amount has not been corroborated by replicate analysis.
No certified reference materials are available upon which to base the results of an assay.	No certified reference material was available for this analyte. The reported drug amount is based upon a standard of uncertified purity.
Other incomplete testing due to lack of sufficient sample.	Insufficient sample is available for normal testing.

All reported immunoassays without further confirmation will include the disclaimer:

*Note: Screening of the specimen(s) submitted has yielded the following preliminary results. Should confirmatory or additional testing be required, you must contact this office within ninety (90) days of the issuance of this report. The specimen(s) will be destroyed after ninety (90) days.*

## 6 Appendix A: Normative Documents

### 6.1 Omnibus DWI Act (5-65-100s)

#### 5-65-101. Omnibus DWI Act -- Application.

This act shall be known as the "Omnibus DWI Act".

#### 5-65-102. Definitions.

As used in this act:

(1) (A) "Controlled substance" means a drug, substance, or immediate precursor in Schedules I through VI.

(B) The fact that any person charged with a violation of this act is or has been entitled to use that drug or controlled substance under the laws of this state does not constitute a defense against any charge of violating this act;

(2) "Intoxicated" means influenced or affected by the ingestion of alcohol, a controlled substance, any intoxicant, or any combination of alcohol, a controlled substance, or an intoxicant, to such a degree that the driver's reactions, motor skills, and judgment are substantially altered and the driver, therefore, constitutes a clear and substantial danger of physical injury or death to himself and other motorists or pedestrians;

(3) "Sworn report" means a signed and written statement of a certified law enforcement officer, under penalty of perjury, on a form provided by the Director of the Department of Finance and Administration; and

(4) "Victim impact statement" means a voluntary written or oral statement of a victim, or relative of a victim, who has sustained serious injury due to a violation of this act.

#### 5-65-103. Unlawful acts.

(a) It is unlawful and punishable as provided in this act for any person who is intoxicated to operate or be in actual physical control of a motor vehicle.

(b) It is unlawful and punishable as provided in this act for any person to operate or be in actual physical control of a motor vehicle if at that time the alcohol concentration in the person's breath or blood was eight-hundredths (0.08) or more based upon the definition of breath, blood, and urine concentration in § 5-65-204.

#### 5-65-104. Seizure, suspension, and revocation of license -- Temporary permits -- Ignition interlock restricted license.

(a) (1) At the time of arrest for operating or being in actual physical control of a motor vehicle while intoxicated or while there was an alcohol concentration of eight hundredths (0.08) or more in the person's breath or blood, as provided in § 5-65-103, the arrested person shall immediately surrender his or her license, permit, or other evidence of driving

privilege to the arresting law enforcement officer as provided in § 5-65-402.

**(2)** The Office of Driver Services or its designated official shall suspend or revoke the driving privilege of an arrested person or shall suspend any nonresident driving privilege of an arrested person, as provided in § 5-65-402. The suspension or revocation shall be based on the number of previous offenses as follows:

**(A)** Suspension for:

**(i)** **(a)** Six (6) months for the first offense of operating or being in actual physical control of a motor vehicle while intoxicated or while there was an alcohol concentration of at least eight hundredths (0.08) by weight of alcohol in the person's blood or breath, § 5-65-103.

**(b)** If the Office of Driver Services allows the issuance of an ignition interlock restricted license under § 5-65-118, the ignition interlock restricted license shall be available immediately.

**(c)** The restricted driving permit under § 5-65-120 is not allowed for a suspension under this subdivision (a)(2)(A)(i); and

**(ii)** **(a)** Suspension for six (6) months for the first offense of operating or being in actual physical control of a motor vehicle while intoxicated by the ingestion of or by the use of a controlled substance.

**(b)** The ignition interlock restricted license provision of § 5-65-118 does not apply to a suspension under subdivision (a)(2)(A)(ii)(a) of this section;

**(B)** **(i)** Suspension for twenty-four (24) months for a second offense of operating or being in actual physical control of a motor vehicle while intoxicated or while there was an alcohol concentration of eight hundredths (0.08) or more by weight of alcohol in the person's blood or breath, § 5-65-103, within five (5) years of the first offense.

**(ii)** However, if the office allows the issuance of an ignition interlock restricted license under § 5-65-118, the suspension period for which no restricted license is available is a minimum of forty-five (45) days, followed by restricted driving privileges to allow driving in any and all of the following situations:

**(a)** To and from his or her employment;

**(b)** To and from an educational institution for the purpose of attending class at the educational institution;

**(c)** To and from an alcohol safety education and treatment course for drunk drivers; or

**(d)** To and from an ignition interlock service.

**(iii)** The ignition interlock restricted license provision of § 5-65-118 does not apply to the suspension under subdivisions (a)(2)(B)(i) and (ii) of this section if the person is arrested for an offense of operating or being in actual physical control of a motor vehicle while intoxicated by the ingestion of or by the use of a controlled substance;

**(C) (i)** Suspension for thirty (30) months for the third offense of operating or being in actual physical control of a motor vehicle while intoxicated or while there was an alcohol concentration of eight hundredths (0.08) or more by weight of alcohol in the person's blood or breath, § 5-65-103, within five (5) years of the first offense.

**(ii)** However, if the office allows the issuance of an ignition interlock restricted license under § 5-65-118, the suspension period for which no restricted license is available is a minimum of forty-five (45) days, followed by restricted driving privileges to allow driving in any and all of the following situations:

**(a)** To and from his or her employment;

**(b)** To and from an educational institution for the purpose of attending class at the education institution;

**(c)** To and from an alcohol safety education and treatment course for drunk drivers; or

**(d)** To and from an ignition interlock service.

**(iii)** The ignition interlock restricted license provision of § 5-65-118 does not apply to the suspension under subdivisions (a)(2)(C)(i) and (ii) if the person is arrested for an offense of operating or being in actual physical control of a motor vehicle while intoxicated by the ingestion of or by the use of a controlled substance; and

**(D)** Revocation for four (4) years, during which no restricted permits may be issued, for the fourth or subsequent offense of operating or being in actual physical control of a motor vehicle while intoxicated or while there was an alcohol concentration of eight hundredths (0.08) or more by weight of alcohol in the person's blood or breath, § 5-65-103, within five (5) years of the first offense.

**(3)** If a person is a resident who is convicted of driving without a license or permit to operate a motor vehicle and the underlying basis for the suspension, revocation, or restriction of the license was for a violation of § 5-65-103, in addition to any other penalties provided for under law, the office may restrict the offender to only an ignition interlock restricted license for a period of one (1) year prior to the reinstatement or reissuance of a license or permit after the person would otherwise be eligible for reinstatement or reissuance of the person's license.

**(4)** In order to determine the number of previous offenses to consider when suspending or revoking the arrested person's driving privileges, the office shall consider as a previous offense any of the following that occurred within the five (5) years immediately before the current offense:

**(A)** Any conviction for an offense of operating or being in actual physical control of a motor vehicle while intoxicated or while there was an alcohol concentration of eight hundredths (0.08) or more in the person's breath or blood, including a violation of § 5-10-105(a)(1)(A) or (B), that occurred:

**(i)** In Arkansas; or

(ii) In another state;

(B) Any suspension or revocation of driving privileges for an arrest for operating or being in actual physical control of a motor vehicle while intoxicated or while there was an alcohol concentration of eight hundredths (0.08) or more in the person's breath or blood under § 5-65-103 when the person was not subsequently acquitted of the criminal charges; or

(C) Any conviction under § 5-76-102 for an offense of operating a motorboat on the waters of this state while intoxicated or while there was an alcohol concentration in the person's breath or blood of eight hundredths (0.08) or more based upon the definition of breath, blood, and urine concentration in § 5-65-204 or refusing to submit to a chemical test under § 5-76-104 occurring on or after July 31, 2007, when the person was not subsequently acquitted of the criminal charges.

(b) (1) (A) Any person whose license is suspended or revoked pursuant to this section is required to complete an alcohol education program or an alcohol treatment program as approved by the Office of Alcohol and Drug Abuse Prevention unless the charges are dismissed or the person is acquitted of the charges upon which the suspension or revocation is based.

(B) If during the period of suspension or revocation under subdivision (b)(1)(A) of this section the person commits an additional violation of § 5-65-103, he or she is also required to complete an approved alcohol education program or alcohol treatment program for each additional violation, unless:

(i) The additional charges are dismissed; or

(ii) He or she is acquitted of the additional charges.

(2) A person whose license is suspended or revoked pursuant to this section shall furnish proof of attendance at and completion of the alcohol education program or the alcohol treatment program required under subdivision (b)(1) of this section before reinstatement of his or her suspended or revoked driver's license or shall furnish proof of dismissal or acquittal of the charge on which the suspension or revocation is based.

(3) Even if a person has filed a de novo petition for review pursuant to former subsection (c) of this section, the person is entitled to reinstatement of driving privileges upon complying with this subsection and is not required to postpone reinstatement until the disposition of the de novo review in circuit court has occurred.

#### **5-65-105. Operation of motor vehicle during period of license suspension or revocation.**

Any person whose privilege to operate a motor vehicle has been suspended or revoked under a provision of this act who operates a motor vehicle in this state during the period of the suspension or revocation shall be imprisoned for ten (10) days and may be assessed a fine of not more than one thousand dollars (\$1,000).

#### **5-65-106. Impoundment of license plate.**

**(a)** When any law enforcement officer arrests a person for operating a motor vehicle while that person's operator's license or permit has been suspended or revoked under the laws of any state due to the person having previously been found guilty or having pleaded guilty or nolo contendere to violating § 5-65-103, and if the motor vehicle operated by the person is owned in whole or part by the person, the motor vehicle license plate shall be impounded by the law enforcement officer for no less than ninety (90) days.

**(b)** If the court determines it is in the best interest of dependents of the offender, the court shall instruct the Director of the Department of Finance and Administration to issue a temporary substitute license plate to that vehicle, and the license plate shall indicate that the original plate has been impounded.

**5-65-107. Persons arrested to be tried on charges -- No charges reduced -- Filing citations.**

**(a)** A person arrested for violating § 5-65-103 shall be tried on those charges or plead to those charges, and no such charges shall be reduced.

**(b)** Furthermore, when a law enforcement officer issues a citation for violating § 5-65-103, the citation shall be filed with the court as soon as possible.

**5-65-108. No probation prior to adjudication of guilt.**

**(a)** Section 16-93-301 et seq., allows a circuit court judge, district court judge, or city court judge to place on probation a first offender who pleads guilty or nolo contendere prior to an adjudication of guilt.

**(b)** Upon successful completion of the probation terms, the circuit court judge, district court judge, or city court judge is allowed to discharge the accused without a court adjudication of guilt and expunge the record.

**(c)** **(1)** No circuit court judge, district court judge, or city court judge may utilize the provisions of § 16-93-301 et seq. in an instance in which the defendant is charged with violating § 5-65-103.

**(2)** Notwithstanding the provisions of § 5-4-301, § 5-4-322, or subdivision (c)(1) of this section, in addition to the mandatory penalties required for a violation of § 5-65-103, a circuit court judge, district court judge, or city court judge may utilize probationary supervision solely for the purpose of monitoring compliance with his or her orders and require an offender to pay a reasonable fee in an amount to be established by the circuit court judge, district court judge, or city court judge.

**5-65-109. Presentencing report.**

**(a)** The court shall immediately request and the Office of Alcohol and Drug Abuse Prevention or its designee shall provide a presentence screening and assessment report of the defendant upon a plea of guilty or nolo contendere to or a finding of guilt of violating § 5-65-103 or § 5-65-303.

**(b)** **(1)** The presentence report shall be provided within thirty (30) days of the request, and the court shall not pronounce sentence until receipt of the presentence report.

**(2) (A)** After entry of a plea of guilty or nolo contendere or a finding of guilt and if the sentencing of the defendant is delayed by the defendant, the clerk of the court shall notify the defendant by first class mail sent to the defendant's last known address that the defendant has fifteen (15) days to appear and show cause for failing to appear for sentencing.

**(B)** After expiration of the fifteen (15) days, the court may proceed with sentencing even in the absence of the defendant.

**(c)** The report shall include, but not be limited to, the defendant's driving record, an alcohol problem assessment, and a victim impact statement when applicable.

**5-65-110. Record of violations and court actions -- Abstract.**

**(a)** Any magistrate or judge of a court shall keep or cause to be kept a record of any violation of this act presented to that court and shall keep a record of any official action by that court in reference to the violation including, but not limited to, a record of every finding of guilt, plea of guilty or nolo contendere, judgment of acquittal, and the amount of fine and jail sentence.

**(b)** Within thirty (30) days after sentencing a person who has been found guilty or pleaded guilty or nolo contendere on a charge of violating any provision of this act, the magistrate of the court or clerk of the court shall prepare and immediately forward to the Office of Driver Services an abstract of the record of the court covering the case in which the person was found guilty or pleaded guilty or nolo contendere, and the abstract shall be certified by the person so required to prepare it to be true and correct.

**(c)** The abstract shall be made upon a form furnished by the office and shall include:

- (1)** The name and address of the party charged;
- (2)** The number, if any, of the operator's or chauffeur's license of the party charged;
- (3)** The registration number of the vehicle involved;
- (4)** The date of hearing;
- (5)** The plea;
- (6)** The judgment; and
- (7)** The amount of the fine and jail sentence, as the case may be.

**5-65-111. Prison terms -- Exception.**

**(a) (1) (A)** Any person who pleads guilty or nolo contendere to or is found guilty of violating § 5-65-103, for a first offense, may be imprisoned for no less than twenty-four (24) hours and no more than one (1) year.

**(B)** However, the court may order public service in lieu of jail, and in that instance, the court shall include the reasons for the order of public service in lieu of jail in the court's written order or judgment.

**(2) (A)** However, if a passenger under sixteen (16) years of age was in the vehicle at the time of the offense, a person who pleads guilty or nolo contendere to or is found guilty of violating § 5-65-103, for a first offense, may be imprisoned for no fewer than seven (7) days and no more than one (1) year.

**(B)** However, the court may order public service in lieu of jail, and in that instance, the court shall include the reasons for the order of public service in lieu of jail in the court's written order or judgment.

**(b)** Any person who pleads guilty or nolo contendere to or is found guilty of violating § 5-65-103 or any other equivalent penal law of another state or foreign jurisdiction shall be imprisoned or shall be ordered to perform public service in lieu of jail as follows:

**(1) (A)** For no fewer than seven (7) days but no more than one (1) year for the second offense occurring within five (5) years of the first offense or no fewer than thirty (30) days of community service.

**(B) (i)** However, if a person under sixteen (16) years of age was in the vehicle at the time of the offense, for no fewer than thirty (30) days but no more than one (1) year for the second offense occurring within five (5) years of the first offense or no fewer than sixty (60) days of community service.

**(ii)** If the court orders community service, the court shall clearly set forth in written findings the reasons for the order of community service;

**(2) (A)** For no fewer than ninety (90) days but no more than one (1) year for the third offense occurring within five (5) years of the first offense or no fewer than ninety (90) days of community service.

**(B) (i)** However, if a person under sixteen (16) years of age was in the vehicle at the time of the offense, for no fewer than one hundred twenty days (120) days but no more than one (1) year for the third offense occurring within five (5) years of the first offense or no fewer than one hundred twenty (120) days of community service.

**(ii)** If the court orders community service, the court shall clearly set forth in written findings the reasons for the order of community service;

**(3) (A)** For at least one (1) year but no more than six (6) years for the fourth offense occurring within five (5) years of the first offense or not less than one (1) year of community service and is guilty of a felony.

**(B) (i)** However, if a person under sixteen (16) years of age was in the vehicle at the time of the offense, for at least two (2) years but no more than six (6) years for the fourth offense occurring within five (5) years of the first offense or not less than two (2) years of community service and is guilty of a felony.

**(ii)** If the court orders community service, the court shall clearly set forth in written findings the reasons for the order of community service; and

**(4) (A) (i)** For at least two (2) years but no more than ten (10) years for the fifth or subsequent offense occurring within five (5) years of the first offense or not less

than two (2) years of community service and is guilty of a felony.

**(ii)** If the court orders community service, the court shall clearly set forth in written findings the reasons for the order of community service.

**(B)** **(i)** However, if a person under sixteen (16) years of age was in the vehicle at the time of the offense, for at least three (3) years but no more than ten (10) years for the fifth offense occurring within five (5) years of the first offense or not less than three (3) years of community service and is guilty of a felony.

**(ii)** If the court orders community service, the court shall clearly set forth in written findings the reasons for the order of community service.

**(c)** For any arrest or offense occurring before July 30, 1999, but that has not reached a final disposition as to judgment in court, the offense shall be decided under the law in effect at the time the offense occurred, and any defendant is subject to the penalty provisions in effect at that time and not under the provisions of this section.

**(d)** It is an affirmative defense to prosecution under subdivisions (a)(2), (b)(1)(B), (b)(2)(B), (b)(3)(B), and (b)(4)(B) of this section that the person operating or in actual physical control of the motor vehicle was not more than two (2) years older than the passenger.

**(e)** A prior conviction for § 5-10-105(a)(1)(A) or (B) is considered a previous offense for purposes of subsection (b) of this section.

#### **5-65-112. Fines.**

Any person who pleads guilty or nolo contendere to or is found guilty of violating § 5-65-103 shall be fined:

**(1)** No less than one hundred fifty dollars (\$150) and no more than one thousand dollars (\$1,000) for the first offense;

**(2)** No less than four hundred dollars (\$400) and no more than three thousand dollars (\$3,000) for the second offense occurring within five (5) years of the first offense; and

**(3)** No less than nine hundred dollars (\$900) and no more than five thousand dollars (\$5,000) for the third or subsequent offense occurring within five (5) years of the first offense.

#### **5-65-113. [Repealed.]**

#### **5-65-114. Inability to pay -- Alternative public service work.**

If it is determined that any individual against whom fines, fees, or court costs are levied for driving while intoxicated or driving while impaired is financially unable to pay the fines, fees, or costs, the court levying the fines, fees, or costs shall order the individual to perform public service work of such type and for such duration as deemed appropriate by the court.

#### **5-65-115. Alcohol treatment or education program -- Fee.**

**(a) (1)** Any person whose driving privileges are suspended or revoked for violating § 5-65-103, § 5-65-303, § 5-65-310, or § 3-3-203 is required to complete an alcohol education program provided by a contractor with the Office of Alcohol and Drug Abuse Prevention or an alcoholism treatment program licensed by the Office of Alcohol and Drug Abuse Prevention.

**(2) (A)** The alcohol education program may collect a program fee of up to one hundred twenty-five dollars (\$125) per enrollee to offset program costs. **(B)**

**(i)** A person ordered to complete an alcohol education program under this section may be required to pay, in addition to the costs collected for education or treatment, a fee of up to twenty-five dollars (\$25.00) to offset the additional costs associated with reporting requirements under this subchapter.

**(ii)** The alcohol education program shall report monthly to the Office of Alcohol and Drug Abuse Prevention all revenue derived from this fee.

**(b) (1)** A person whose license is suspended or revoked for violating § 5-65-103 shall:

**(A)** Both:

**(i)** Furnish proof of attendance at and completion of the alcoholism treatment program or alcohol education program required under § 5-65-104(b)(1) before reinstatement of his or her suspended or revoked driver's license; and

**(ii)** Pay any fee for reinstatement required under § 5-65-119 or § 5-65-304; or

**(B)** Furnish proof of dismissal or acquittal of the charge on which the suspension or revocation is based.

**(2)** An application for reinstatement shall be made to the Office of Driver Services.

**(c)** Even if a person has filed a de novo petition for review pursuant to § 5-65-402, the person is entitled to reinstatement of driving privileges upon complying with this section and is not required to postpone reinstatement until the disposition of the de novo review in circuit court has occurred.

**(d) (1)** A person suspended under this act may enroll in an alcohol education program prior to disposition of the offense by the circuit court, district court, or city court.

**(2)** However, the person is not entitled to any refund of a fee paid if the charges are dismissed or if the person is acquitted of the charges.

**(e)** Each alcohol education program or alcoholism treatment program shall remit the fees imposed under this section to the Office of Alcohol and Drug Abuse Prevention.

#### **5-65-116. Denial of driving privileges for minor -- Restricted permit.**

**(a)** As used in this section, "drug offense" means the same as in § 5-64-710.

**(b) (1) (A)** If a person who is less than eighteen (18) years of age pleads guilty or nolo contendere to or is found guilty of driving while intoxicated under § 5-65-101 et seq.,

or of any criminal offense involving the illegal possession or use of controlled substances, or of any drug offense, in this state or any other state, or is found by a juvenile court to have committed such an offense, the court having jurisdiction of the matter, including any federal court, shall prepare and transmit to the Department of Finance and Administration an order of denial of driving privileges for the minor.

**(B)** A court within the State of Arkansas shall prepare and transmit any order under subdivision (b)(1)(A) of this section within twenty-four (24) hours after the plea or finding to the department.

**(C)** A court outside Arkansas having jurisdiction over any person holding driving privileges issued by the State of Arkansas shall prepare and transmit any order under subdivision (b)(1)(A) of this section pursuant to an agreement or arrangement entered into between that state and the Director of the Department of Finance and Administration.

**(D)** An arrangement or agreement under subdivision (b)(1)(C) of this section may also provide for the forwarding by the department of an order issued by a court within this state to the state where the person holds driving privileges issued by that state.

**(2)** For any person holding driving privileges issued by the State of Arkansas, a court within this state in a case of extreme and unusual hardship may provide in an order for the issuance of a restricted driving permit to allow driving to and from a place of employment or driving to and from school.

**(c)** A penalty prescribed in this section or § 27-16-914 is in addition to any other penalty prescribed by law for an offense covered by this section and § 27-16-914.

**(d)** In regard to any offense involving illegal possession under this section, it is a defense if the controlled substance is the property of an adult who owns the vehicle.

#### **5-65-117. Seizure and sale of motor vehicles.**

**(a) (1) (A)** Any person who pleads guilty or nolo contendere or is found guilty of violating § 5-65-103 for a fourth offense occurring within three (3) years of the first offense, at the discretion of the court, may have his or her motor vehicle seized.

**(B)** If the motor vehicle is seized, the title to the motor vehicle is forfeited to the state.

**(2) (A)** If ordered by the court, it is the duty of the sheriff of the county where the offense occurred to seize the motor vehicle.

**(B)** The court may issue an order directing the sheriff to sell the motor vehicle seized at a public auction to the highest bidder within thirty (30) days from the date of judgment.

**(b) (1)** The sheriff shall advertise the motor vehicle for sale for a period of two (2) weeks prior to the date of sale by at least one (1) insertion per week in a newspaper having a bona fide circulation in the county.

**(2)** The notice shall include a brief description of the motor vehicle to be sold and the time, place, and terms of the sale.

**(c)** The proceeds of the sale of the seized motor vehicle shall be deposited into the county general fund.

**(d)** **(1)** After the sheriff has made the sale and has turned over the proceeds of the sale to the county treasurer, the sheriff shall report his or her actions to the court in which the defendant was tried.

**(2)** The report required by subdivision (d)(1) of this section shall be filed with the court within sixty (60) days from the date of judgment.

**(e)** A forfeiture of a conveyance encumbered by a bona fide security interest is subject to the interest of the secured party if the secured party neither had knowledge of nor consented to the act or omission.

### **5-65-118. Additional penalties -- Ignition interlock devices.**

**(a)** **(1)** **(A)** **(i)** In addition to any other penalty authorized for a violation of this chapter, upon an arrest of a person for violating § 5-65-103 for a first or second offense, the Office of Driver Services may restrict the person to operating only a motor vehicle that is equipped with a functioning ignition interlock device.

**(ii)** The restriction may continue for a period of up to one (1) year after the person's license is no longer suspended or restricted under the provisions of § 5-65-104.

**(B)** Upon a finding that a person is financially able to afford an ignition interlock device and upon an arrest for a violation of § 5-65-103 for a third or subsequent offense, the office may restrict the offender to operate only a motor vehicle that is equipped with a functioning ignition interlock device for up to one (1) year after the person's license is no longer suspended or restricted under § 5-65-104.

**(2)** In accordance with the requirements under the provisions of § 5-65-104, the office may issue an ignition interlock restricted license to the person only after the person has verified installation of a functioning ignition interlock device to the office in any motor vehicle the person intends to operate, except for an exemption allowed under subsection (g) of this section.

**(3)** The office shall establish:

**(A)** A specific calibration setting no lower than two hundredths of one percent (.02%) nor more than five hundredths of one percent (.05%) of alcohol in the person's blood at which the ignition interlock device will prevent the motor vehicle's being started; and

**(B)** The period of time that the person is subject to the restriction.

**(4)** As used in this section, "ignition interlock device" means a device that connects a motor vehicle ignition system to a breath-alcohol analyzer and prevents a motor vehicle

ignition from starting if a driver's blood alcohol level exceeds the calibration setting on the device.

**(b)** Upon restricting the offender to the use of an ignition interlock device, the office shall:

**(1) (A)** State on the record the requirement for and the period of use of the ignition interlock device.

**(B)** However, if the office restricts the offender to the use of an ignition interlock device in conjunction with the issuance of an ignition interlock restricted license under a provision of § 5-65-104, the period of requirement of use of the ignition interlock device shall be at least the remaining time period of the original suspension imposed under § 5-65-104;

**(2)** Ensure that the records of the office reflect that the person may not operate a motor vehicle that is not equipped with an ignition interlock device;

**(3)** Attach or imprint a notation on the driver's license of any person restricted under this section stating that the person may operate only a motor vehicle equipped with an ignition interlock device;

**(4)** Require the person restricted under this section to show proof of installation of a certified ignition interlock device prior to the issuance by the office of an ignition interlock restricted license under a provision of § 5-65-104;

**(5)** Require proof of the installation of the ignition interlock device and periodic reporting by the person for verification of the proper operation of the ignition interlock device;

**(6)** Require the person to have the ignition interlock device serviced and monitored at least every sixty-seven (67) days for proper use and accuracy by an entity approved by the Department of Health; and

**(7) (A)** Require the person to pay the reasonable cost of leasing or buying and monitoring and maintaining the ignition interlock device.

**(B)** The office may establish a payment schedule for the reasonable cost of leasing or buying and monitoring and maintaining the ignition interlock device.

**(c) (1)** A person restricted under this section to operate only a motor vehicle that is equipped with an ignition interlock device may not solicit or have another person start or attempt to start a motor vehicle equipped with an ignition interlock device.

**(2)** Except as provided in subsection (g) of this section, a violation of this subsection is a Class A misdemeanor.

**(d) (1)** A person may not start or attempt to start a motor vehicle equipped with an ignition interlock device for the purpose of providing an operable motor vehicle to a person who is restricted under this section to operate only a motor vehicle that is equipped with an ignition interlock device.

**(2)** Except as provided in subsection (g) of this section, a violation of this subsection

is a Class A misdemeanor.

**(e) (1)** A person may not tamper with or in any way attempt to circumvent the operation of an ignition interlock device that has been installed in a motor vehicle.

**(2)** Except as provided in subsection (g) of this section, a violation of this subsection is a Class A misdemeanor.

**(f)**

**(1)** A person may not knowingly provide a motor vehicle not equipped with a functioning ignition interlock device to another person who the provider of the vehicle knows or should know was restricted to operate only a motor vehicle equipped with an ignition interlock device.

**(2)** Except as provided in subsection (g) of this section, a violation of this subsection is a Class A misdemeanor.

**(g) (1)** Any person found to have violated subsections (c)-(f) of this section is guilty of a Class A misdemeanor.

**(2)** However, the penalty provided in subdivision (g)(1) of this section does not apply if:

**(A)** The starting of a motor vehicle or the request to start a motor vehicle equipped with an ignition interlock device is done for the purpose of safety or mechanical repair of the ignition interlock device or the motor vehicle and the person subject to the restriction does not operate the motor vehicle; or

**(B) (i)** The court finds that a person is required to operate a motor vehicle in the course and scope of the person's employment and, if the motor vehicle is owned by the employer, that the person may operate that motor vehicle during regular working hours for the purposes of his or her employment without installation of an ignition interlock device if the employer has been notified of the driving privilege restriction and if proof of that notification is with the motor vehicle.

**(ii)** However, the employment exemption in subdivision (g)(2)(B)(i) does not apply if the business entity that owns the motor vehicle is owned or controlled by the person who is prohibited from operating a motor vehicle not equipped with an ignition interlock device.

**(h)** If the person restricted under this section cannot provide proof of installation of a functioning ignition interlock device to the office under subsection (a) of this section, the office shall not issue an ignition interlock restricted license as authorized under this section.

**(i)** In addition to any other penalty authorized under this section, if the office finds that a person has violated a condition under this section related to the proper use, circumvention, or maintenance of an ignition interlock device, the office shall revoke the ignition interlock restricted license and reinstate a license suspension for the term of the original license suspension.

**(j)** Any person whose license was suspended under § 5-65-104 who would otherwise be eligible to obtain an ignition interlock restricted license may petition the office for a hearing and the office or its designated official may issue an ignition interlock restricted license as authorized under the applicable provisions of §§ 5-65-104 and 5-65-205.

**(k)** **(1)** The department shall:

**(A)** Certify the ignition interlock devices for use in this state,

**(B)** Approve the entities that install and monitor the ignition interlock devices; and

**(C)** Adopt rules and regulations for the certification of the ignition interlock devices and ignition interlock device installation.

**(2)** The rules and regulations shall require an ignition interlock device, at a minimum, to:

**(A)** Not impede the safe operation of the motor vehicle;

**(B)** Minimize the opportunities to be bypassed;

**(C)** Work accurately and reliably in an unsupervised environment;

**(D)** Properly and accurately measure the person's blood alcohol levels;

**(E)** Minimize the inconvenience to a sober user; and

**(F)** Be manufactured by an entity that is responsible for installation, user training, and servicing and maintenance of the ignition interlock device, and that is capable of providing monitoring reports to the office.

**(3)** The division shall develop a warning label to be affixed to any ignition interlock device used in the state to warn any person of the possible penalties for tampering with or attempting to circumvent the ignition interlock device.

**(4)** The division shall:

**(A)** Publish and update a list of certified ignition interlock device manufacturers and approved ignition interlock device installers; and

**(B)** Periodically provide the list required by subdivision (k)(4)(A) of this section to the office.

#### **5-65-119. Distribution of fee.**

**(a)** The Office of Driver Services shall charge a fee to be calculated as provided under subsection (b) of this section for reinstating a driving privilege suspended or revoked because of an arrest for operating or being in actual physical control of a motor vehicle while intoxicated or while there was an alcohol concentration of eight-hundredths (0.08) or more in the person's breath or blood, § 5-65-103, or refusing to submit to a chemical test of blood, breath, or urine for the purpose of determining the alcohol or controlled substance contents of the person's blood or breath, § 5-65-205, and the fee shall be

distributed as follows:

**(1)** Seven percent (7%) of the revenues derived from this fee shall be deposited into the State Treasury as special revenues and credited to the Public Health Fund to be used exclusively for the Office of Alcohol Testing of the Division of Health of the Department of Health and Human Services;

**(2)** Thirty-three percent (33%) of the revenues derived from this fee shall be deposited as special revenues into the State Treasury into the Constitutional Officers Fund and the State Central Services Fund as a direct revenue to be used by the Office of Driver Services for use in supporting the administrative driver's licensing revocation and sanctions programs provided for in this subchapter;

**(3)** Ten percent (10%) of the revenues derived from this fee shall be deposited into the State Treasury, and the Treasurer of State shall credit them as general revenues to the various funds in the respective amounts to each and to be used for the purposes as provided in the Revenue Stabilization Law, § 19-5-101 et seq.; and

**(4)** Fifty percent (50%) of the revenues derived from this fee shall be deposited into the State Treasury as special revenues to the credit of the Department of Arkansas State Police Fund.

**(b) (1) (A)** The reinstatement fee shall be calculated by multiplying one hundred fifty dollars (\$150) by each separate occurrence of an offense resulting in an administrative suspension order under § 5-65-103 or § 5-65-205 unless the administrative suspension order has been removed because:

**(i)** The person has been found not guilty of the offense by a circuit court or district court; or

**(ii)** A de novo review of the administrative suspension order by the Office of Driver Services results in the removal.

**(B)** The fee under this section is supplemental to and in addition to any fee imposed under § 5-65-304, § 5-65-310, § 27-16-508, or § 27-16-808.

**(2)** As used in this subsection, "occurrence" means each separate calendar date when an offense or offenses take place.

#### **5-65-120. Restricted driving permit.**

**(a)** Following an administrative hearing for suspension or revocation of a driver's license as provided for in § 5-65-402, or upon a request of a person whose privilege to drive has been denied or suspended, the Office of Driver Services or its designated agent may modify the denial or suspension in a case of extreme and unusual hardship by the issuance of a restricted driving permit when, upon a review of the person's driving record for a time period of five (5) years prior to the current denial, revocation, or suspension of driving privilege or a driver's license, at the discretion of the office or its designated agent it is determined that:

**(1)** The person:

- (A) Is not a multiple traffic law offender; or
- (B) Does not present a threat to the general public; and

(2) No other adequate means of transportation exists for the person except to allow driving in any of the following situations:

- (A) To and from the person's place of employment;
- (B) In the course of the person's employment;
- (C) To and from an educational institution for the purpose of attending a class if the person is enrolled and regularly attending a class at the institution;
- (D) To and from an alcohol education program or alcoholism treatment program for drunk drivers; or
- (E) To and from a hospital or clinic for medical treatment or care for an illness, disease, or other medical condition of the person or a family member.

(b) The restricted driving permit shall state the specific times and circumstances under which driving is permitted.

(c) The restricted driving permit shall not be granted to any person suspended for a second or subsequent offense of violating § 5-65-103, § 5-65-205, § 5-65-303, or § 5-65-310.

#### **5-65-121. Victim impact panel attendance -- Fee.**

(a) (1) A person whose driving privileges are suspended or revoked for violating § 5-65-103, § 5-65-205, § 5-65-303, § 5-65-310, or § 3-3-203 shall attend a victim impact panel sponsored by an organization approved by the Office of Alcohol and Drug Abuse Prevention of the Department of Human Services.

(2) The organization selected by the office shall be an organization that provides statewide services to victims of drunk driving.

(b) (1) The organization approved by the office may collect a program fee of ten dollars (\$10.00) per enrollee to offset program costs to be remitted to the organization.

(2) The organization approved by the office shall provide proof of attendance and completion to the person required to attend the victim impact panel upon completion of the victim impact panel.

## **6.2 5-65-200s**

### **5-65-201. Rules and regulations.**

The Division of Health of the Department of Health and Human Services may promulgate rules and regulations reasonably necessary to carry out the purposes of this subchapter.

### **5-65-202. Implied consent.**

**(a)** Any person who operates a motor vehicle or is in actual physical control of a motor vehicle in this state is deemed to have given consent, subject to the provisions of § 5-65-203, to one (1) or more chemical tests of his or her blood, breath, or urine for the purpose of determining the alcohol or controlled substance content of his or her breath or blood if:

**(1)** The person is arrested for any offense arising out of an act alleged to have been committed while the person was driving while intoxicated or driving while there was an alcohol concentration of eight hundredths (0.08) or more in the person's breath or blood;

**(2)** The person is involved in an accident while operating or in actual physical control of a motor vehicle; or

**(3)** At the time the person is arrested for driving while intoxicated, the law enforcement officer has reasonable cause to believe that the person, while operating or in actual physical control of a motor vehicle, is intoxicated or has an alcohol concentration of eight hundredths (0.08) or more in the person's breath or blood.

**(b)** Any person who is dead, unconscious, or otherwise in a condition rendering him or her incapable of refusal is deemed not to have withdrawn the consent provided by subsection (a) of this section, and one (1) or more chemical tests may be administered subject to the provisions of § 5-65-203.

### **5-65-203. Administration.**

**(a)** One (1) or more chemical tests authorized in § 5-65-202 shall be administered at the direction of a law enforcement officer having reasonable cause to believe the person to have been operating or in actual physical control of a motor vehicle while intoxicated or while there was an alcohol concentration of eight hundredths (0.08) or more in the person's breath or blood.

**(b) (1)** The law enforcement agency by which the law enforcement officer is employed shall designate which chemical test or chemical tests shall be administered, and the law enforcement agency is responsible for paying any expense incurred in conducting the chemical test or chemical tests.

**(2)** If the person tested requests that additional chemical test or chemical tests be made, as authorized in § 5-65-204(e), the cost of the additional chemical test or chemical tests shall be borne by the person tested, unless the person is found not guilty in which case the arresting law enforcement agency shall reimburse the person for the cost of the additional chemical test or chemical tests.

**(3)** If any person objects to the taking of his or her blood for a chemical test, as authorized in this chapter, the breath or urine of the person may be used to make the chemical analysis.

**5-65-204. Validity -- Approved methods.**

**(a) (1)** "Alcohol concentration" means either:

**(A)** Grams of alcohol per one hundred milliliters (100 ml) or one hundred cubic centimeters (100 cc) of blood; or

**(B)** Grams of alcohol per two hundred ten liters (210 l) of breath.

**(2)** The alcohol concentration of other bodily substances is based upon grams of alcohol per one hundred milliliters (100 ml) or one hundred cubic centimeters (100 cc) of blood, the same being percent weight per volume or percent alcohol concentration.

**(b) (1) (A)** A chemical analysis made to determine the presence and amount of alcohol in a person's blood, urine, or breath to be considered valid under this chapter shall be performed according to a method approved by the Department of Health or by an individual possessing a valid certificate issued by the department for this purpose.

**(B)** The department may:

**(i)** Approve satisfactory techniques or methods for the chemical analysis;

**(ii)** Ascertain the qualifications and competence of an individual to conduct the chemical analysis; and

**(iii)** Issue a certificate that is subject to termination or revocation at the discretion of the department.

**(C) (i)** An auxiliary law enforcement officer appointed as a reserve law enforcement officer and certified by the department in the operation of an instrument used to determine the alcohol content of the breath may operate an instrument used to determine the alcohol content of the breath under this chapter.

**(ii)** The department shall promulgate rules to implement subdivision (b)(1)(C)(i) of this section.

**(2)** However, a method of chemical analysis of a person's blood, urine, or other bodily substance made by the State Crime Laboratory for determining the presence of one (1) or more controlled substances or any intoxicant is exempt from approval by the division or the State Board of Health.

**(c)** To be considered valid under the provisions of this section, a chemical analysis of a person's blood, urine, breath, or other bodily substance for determining the alcohol content of the blood or breath shall be performed according to a method approved by the board.

**(d) (1)** When a person submits to a blood test at the request of a law enforcement officer under a provision of this section, blood may be drawn by a physician or a person

acting under the direction and supervision of a physician.

**(2)** The limitation in subdivision (d)(1) of this section does not apply to the taking of a breath or urine specimen.

**(3) (A)** No person, institution, or office in this state that withdraws blood for the purpose of determining alcohol or controlled substance content of the blood at the request of a law enforcement officer under a provision of this chapter shall be held liable for violating any criminal law of this state in connection with the withdrawing of the blood.

**(B)** No physician, institution, or person acting under the direction or supervision of a physician shall be held liable in tort for the withdrawal of the blood unless the person is negligent in connection with the withdrawal of the blood or the blood is taken over the objections of the subject.

**(e) (1)** The person tested may have a physician or a qualified technician, registered nurse, or other qualified person of his or her own choice administer a complete chemical test in addition to any chemical test administered at the direction of a law enforcement officer.

**(2)** The law enforcement officer shall advise the person in writing of the right provided in subdivision (e)(1) of this section and that if the person chooses to have an additional chemical test and the person is found not guilty, the arresting law enforcement agency shall reimburse the person for the cost of the additional chemical test.

**(3)** The refusal or failure of a law enforcement officer to advise a person of the right provided in subdivision (e)(1) of this section and to permit and assist the person to obtain a chemical test under subdivision (e)(1) of this section precludes the admission of evidence relating to a chemical test taken at the direction of a law enforcement officer.

**(f)** Upon the request of the person who submits to a chemical test at the request of a law enforcement officer, full information concerning the chemical test shall be made available to the person or to his or her attorney.

#### **5-65-205. Refusal to submit.**

**(a) (1)** If a person under arrest refuses upon the request of a law enforcement officer to submit to a chemical test designated by the law enforcement agency, as provided in § 5-65-202, no chemical test shall be given, and the person's motor vehicle operator's license shall be seized by the law enforcement officer, and the law enforcement officer shall immediately deliver to the person from whom the motor vehicle operator's license was seized a temporary driving permit, as provided by § 5-65-402.

**(2)** Refusal to submit to a chemical test under this subsection is a strict liability offense and is a violation pursuant to § 5-1-108.

**(b)** The Office of Driver Services shall then proceed to suspend or revoke the driving privilege of the arrested person, as provided in § 5-65-402. The suspension shall be as follows:

**(1) (A) (i)** Suspension for one hundred eighty (180) days for the first offense

of refusing to submit to a chemical test of blood, breath, or urine for the purpose of determining the alcohol or controlled substance content of the person's blood or breath.

**(ii) (a)** However, if the office allows the issuance of an ignition interlock restricted license under § 5-65-118, the ignition interlock restricted license shall be available immediately.

**(b)** The ignition interlock restricted license provision of § 5-65-118 does not apply to the suspension under subdivision (b)(1)(A)(i) of this section if the person is arrested for an offense of operating or being in actual physical control of a motor vehicle while intoxicated by the ingestion of or by the use of a controlled substance.

**(iii)** The restricted driving permit provision of § 5-65-120 does not apply to this suspension.

**(B)** The office, in addition to any other penalty, shall deny to that person the issuance of an operator's license until that person has been issued an ignition interlock restricted license for a period of six (6) months;

**(2)** Suspension for two (2) years, during which no restricted permit may be issued, for a second offense of refusing to submit to a chemical test of blood, breath, or urine for the purposes of determining the alcohol or controlled substance content of the person's blood or breath within five (5) years of the first offense;

**(3)** Revocation for three (3) years, during which no restricted permit may be issued, for the third offense of refusing to submit to a chemical test of blood, breath, or urine for the purpose of determining the alcohol or controlled substance content of the person's blood within five (5) years of the first offense; and

**(4)** Lifetime revocation, during which no restricted permit may be issued, for the fourth or subsequent offense of refusing to submit to a chemical test of blood, breath, or urine for the purpose of determining the alcohol or controlled substance content of the person's blood or breath within five (5) years of the first offense.

**(c)** [Repealed.]

**(d)** In order to determine the number of previous offenses to consider when suspending or revoking the arrested person's driving privileges, the office shall consider as a previous offense any of the following that occurred within the five (5) years immediately before the current offense:

**(1)** Any conviction for an offense of refusing to submit to a chemical test; and

**(2)** Any suspension or revocation of driving privileges for an arrest for refusing to submit to a chemical test when the person was not subsequently acquitted of the criminal charge.

**(e)** In addition to any other penalty provided for in this section:

**(1)** If the person is a resident without a license or permit to operate a motor vehicle in this state, the office shall deny to that person the issuance of a license or permit for a

period of six (6) months for a first offense; and

**(2)** For a second or subsequent offense by a resident without a license or permit to operate a motor vehicle, the office shall deny to that person the issuance of a license or permit for a period of one (1) year.

**5-65-206. Evidence in prosecution.**

**(a)** In any criminal prosecution of a person charged with the offense of driving while intoxicated, the amount of alcohol in the defendant's breath or blood at the time or within four (4) hours of the alleged offense, as shown by chemical analysis of the defendant's blood, urine, breath, or other bodily substance gives rise to the following:

**(1)** If there was at that time an alcohol concentration of four hundredths (0.04) or less in the defendant's blood, urine, breath, or other bodily substance, it is presumed that the defendant was not under the influence of intoxicating liquor; and

**(2)** If there was at the time an alcohol concentration in excess of four hundredths (0.04) but less than eight hundredths (0.08) by weight of alcohol in the defendant's blood, urine, breath, or other bodily substance, this fact does not give rise to any presumption that the defendant was or was not under the influence of intoxicating liquor, but this fact may be considered with other competent evidence in determining the guilt or innocence of the defendant.

**(b)** The provisions in subsection (a) of this section shall not be construed as limiting the introduction of any other relevant evidence bearing upon the question of whether or not the defendant was intoxicated.

**(c)** The chemical analysis referred to in this section shall be made by a method approved by the State Board of Health.

**(d) (1) (A)** Except as provided in subsection (e) of this section, a record or report of a certification, rule, evidence analysis, or other document pertaining to work performed by the Office of Alcohol Testing of the Department of Health under the authority of this chapter shall be received as competent evidence as to the matters contained in the record or report in a court of this state, subject to the applicable rules of criminal procedure when duly attested to by the Director of the Office of Alcohol Testing of the Department of Health or his or her assistant, in the form of an original signature or by certification of a copy.

**(B)** A document described in subdivision (d)(1)(A) of this section is self-authenticating.

**(2)** However, the instrument performing the chemical analysis shall have been duly certified at least one (1) time in the last three (3) months preceding arrest, and the operator of the instrument shall have been properly trained and certified.

**(3)** Nothing in this section is deemed to abrogate a defendant's right to confront the person who performs the calibration test or check on the instrument, the operator of the instrument, or a representative of the office.

**(4)** The testimony of the appropriate analyst or official may be compelled by the

issuance of a proper subpoena by the party who wishes to call the appropriate analyst or official given ten (10) days prior to the date of hearing or trial, in which case the record or report is admissible through the analyst or official, who is subject to cross-examination by the defendant or his or her counsel.

**(e)** When a chemical analysis of a defendant's blood, urine, or other bodily substance is made by the State Crime Laboratory for the purpose of ascertaining the presence of one (1) or more controlled substances or any intoxicant, other than alcohol, in any criminal prosecution under § 5-65-103, § 5-65-303, or § 5-10-105, the provisions of § 12-12-313 govern the admissibility of the chemical analysis into evidence rather than the provisions of this section.

#### **5-65-207. Alcohol testing devices.**

**(a)** **(1)** Any instrument used to determine the alcohol content of the breath for the purpose of determining if the person was operating a motor vehicle while intoxicated or with an alcohol concentration of eight hundredths (0.08) or more shall be so constructed that the analysis is made automatically when a sample of the person's breath is placed in the instrument, and without any adjustment or other action of the person administering the analysis.

**(2)** The instrument shall be so constructed that the alcohol content is shown by visible digital display on the instrument and on an automatic readout.

**(b)** Any breath analysis made by or through the use of an instrument that does not conform to the requirements prescribed in this section is inadmissible in any criminal or civil proceeding.

**(c)** **(1)** The State Board of Health may adopt appropriate rules and regulations to carry out the intent and purposes of this section, and only instruments approved by the board as meeting the requirements of this section and regulations of the board shall be used for making the breath analysis for determining alcohol concentration.

**(2)** **(A)** The Department of Health specifically may limit by its rules the types or models of testing devices that may be approved for use in Arkansas for the purposes set forth in this section.

**(B)** The approved types or models shall be specified by manufacturer's name and model.

**(d)** Any law enforcement agency that conducts alcohol testing shall maintain full compliance with this section.

#### **5-65-208. Motor vehicle accidents -- Testing required.**

**(a)** **(1)** When the driver of a motor vehicle is involved in an accident resulting in loss of human life or when there is reason to believe death may result, in addition to a penalty established elsewhere under state law, a chemical test of the driver's blood, breath, or urine shall be administered to the driver, even if fatally injured, to determine the presence of and percentage of concentration of alcohol or the presence of drugs, or both, in the

driver's body.

**(b) (1)** The law enforcement agency that investigates an accident described in subsection (a) of this section, the physician in attendance, or any other person designated by state law shall order the chemical test as soon as practicable.

**(2) (A)** The medical personnel who conducted the chemical test under subsection (a) of this section of the driver's blood, breath, or urine shall forward the results of the chemical test to the Department of Arkansas State Police, and the department shall establish and maintain the results of the analyses required by subsection (a) of this section in a database.

**(B)** The information in the database shall reflect the number of fatal motor vehicle accidents in which:

**(i)** Alcohol was found to be a factor, with the percentage of alcohol concentration involved;

**(ii)** Drugs were found to be a factor, listing the class of drugs so found and their amounts; and

**(iii)** Both alcohol and drugs were found to be factors, with the percentage of alcohol concentration involved, and listing the class of drugs so found and their amounts.

**(c)** The results of the analyses required by this section shall be reported to the department and may be used by state and local officials for statistical purposes that do not reveal the identity of the deceased person or for any law enforcement purpose, including prosecution for the violation of any law.

#### **5-65-301. Title.**

This subchapter may be known and cited as the "Underage Driving Under the Influence Law" or the "Underage DUI Law".

#### **5-65-302. Definitions.**

As used in this subchapter:

**(1)** "Influence" means being controlled or affected by the ingestion of an alcoholic beverage or similar intoxicant, or any combination of an alcoholic beverage or similar intoxicant, to such a degree that the driver's reactions, motor skills, and judgment are altered or diminished, even to the slightest scale, and the underage driver, therefore, due to inexperience and lack of skill, constitutes a danger of physical injury or death to himself or herself and other motorists or pedestrians; and

**(2)** "Underage" means any person who is under twenty-one (21) years of age and therefore may not legally consume alcoholic beverages in Arkansas.

### **6.3 5-65-300s**

#### **5-65-303. Conduct proscribed.**

**(a)** It is unlawful and punishable as provided in this subchapter for any underage person to operate or be in actual physical control of a motor vehicle while under the influence of an alcoholic beverage or similar intoxicant.

**(b)** It is unlawful and punishable as provided in this subchapter for any underage person to operate or be in actual physical control of a motor vehicle if at that time there was an alcohol concentration of two-hundredths (0.02) but less than eight-hundredths (0.08) in the underage person's breath or blood as determined by a chemical test of the underage person's blood or breath or other bodily substance.

#### **5-65-304. Seizure, suspension, and revocation of license -- Temporary permits.**

**(a)** At the time of arrest for violating § 5-65-303, the arresting law enforcement officer shall seize the motor vehicle operator's license of the underage person arrested and issue to the underage person a temporary driving permit as provided by § 5-65-402.

**(b)** **(1)** The Office of Driver Services shall suspend or revoke the driving privileges of the arrested underage person under the provisions of § 5-65-402 and the arrested underage person shall have the same right to hearing and judicial review as provided under § 5-65-402.

**(2)** The suspension or revocation shall be as follows:

**(A)** Suspension for ninety (90) days for the first offense of violating § 5-65-303;

**(B)** Suspension for one (1) year for the second offense of violating § 5-65-303; and

**(C)** **(i)** Revocation for the third or subsequent offense of violating § 5-65-303 occurring while the person is underage.

**(ii)** Revocation is until the underage person reaches twenty-one (21) years of age or for a period of three (3) years, whichever is longer.

**(c)** In order to determine the number of previous offenses to consider when suspending or revoking the arrested underage person's driving privileges, the office shall consider as a previous offense:

**(1)** Any conviction for violating § 5-65-103 or § 5-65-303; and

**(2)** Any suspension or revocation of driving privileges for an arrest for a violation of § 5-65-103 or § 5-65-303 when the person was not subsequently acquitted of the criminal charge.

**(d)** **(1)** **(A)** **(i)** The office shall charge a fee to be calculated as provided under

subdivision (d)(2)(B) of this section for reinstating a driver's license suspended because of a violation of § 5-65-303 or § 5-65-310.

**(ii)** Forty percent (40%) of the revenues derived from this fee shall be deposited into the State Treasury as special revenues and credited to the Public Health Fund to be used exclusively for the Blood Alcohol Program of the Department of Health.

**(B)** The reinstatement fee is calculated by multiplying twenty-five dollars (\$25.00) by each separate occurrence of an offenses resulting in an administrative suspension order under § 5-65-303 unless the administrative suspension order has been removed because:

**(i)** The person has been found not guilty of the offense by a circuit court or district court; or

**(ii)** A de novo review of the administrative suspension order by the office results in the removal.

**(C)** The fee under this section is supplemental to and in addition to any fee imposed under § 5-65-119, § 5-65-310, § 27-16-508, or § 27-16-808.

**(2)** As used in this subsection, "occurrence" means each separate calendar date when an offense or offenses take place.

#### **5-65-305. Fines.**

**(a)** Any person who pleads guilty or nolo contendere to or is found guilty of violating § 5-65-303 or § 5-65-310 shall be fined:

**(1)** No less than one hundred dollars (\$100) and not more than five hundred dollars (\$500) for the first offense;

**(2)** No less than two hundred dollars (\$200) and not more than one thousand dollars (\$1,000) for the second offense occurring underage; and

**(3)** No less than five hundred dollars (\$500) and not more than two thousand dollars (\$2,000) for the third or subsequent offense occurring underage.

**(b)** For the purpose of determining an underage person's fine under this subchapter, an underage person who has one (1) or more previous convictions or suspensions for a violation of § 5-65-103 or § 5-65-205 is deemed to have a conviction for a violation of this subchapter for each conviction for driving while intoxicated.

#### **5-65-306. Public service work.**

**(a)** Any underage person who pleads guilty or nolo contendere to or is found guilty of violating § 5-65-303 or § 5-65-310 shall be ordered by the court to perform public service work of the type and for the duration as deemed appropriate by the court.

**(b)** The period of community service shall be for:

**(1)** No less than thirty (30) days for a second offense of violating § 5-65-303; and

**(2)** No less than sixty (60) days for a third or subsequent offense of violating § 5-65-303.

**5-65-307. Alcohol and driving education program.**

**(a) (1) (A)** Any person who has his or her driving privileges suspended, revoked, or denied for violating § 3-3-203, § 5-65-310, or § 5-65-303 is required to complete an alcohol and driving education program for underage drivers as prescribed and approved by the Office of Alcohol and Drug Abuse Prevention or an alcoholism treatment program licensed by the Office of Alcohol and Drug Abuse Prevention, or both, in addition to any other penalty provided in this chapter.

**(B)** If during the period of suspension or revocation in subdivision (a)(1)(A) of this section the underage person commits an additional violation of § 3-3-203 or § 5-65-303, the underage person is also required to complete an approved alcohol and driving education program or alcoholism treatment program for each additional violation.

**(2)** The Office of Alcohol and Drug Abuse Prevention shall approve only those programs in alcohol and driving education that are targeted at the underage driving group and are intended to intervene and prevent repeat occurrences of driving under the influence or driving while intoxicated.

**(3) (A) (i)** The alcohol and driving education program may collect a program fee of up to one hundred twenty-five dollars (\$125) per enrollee to offset program costs.

**(ii)** An underage person ordered to complete an alcohol and driving education program or an alcoholism treatment program under this section may be required to pay, in addition to the costs collected for the program, a fee of up to twenty-five dollars (\$25.00) to offset the additional costs associated with reporting requirements under this subchapter.

**(B)** An approved alcohol and driving education program shall report monthly to the Office of Alcohol and Drug Abuse Prevention all revenue derived from these fees.

**(b)** Prior to reinstatement of a driver's license suspended or revoked under this subchapter, the driver shall furnish proof of attendance at and completion of the alcohol and driving education program or alcoholism treatment program required under subdivision (a)(1) of this section.

**(c)** The Office of Alcohol and Drug Abuse Prevention may promulgate rules reasonably necessary to carry out the purposes of this section regarding the approval and monitoring of the alcohol and driving education programs.

**(d) (1) (A)** A person whose license is suspended or revoked for violating § 5-65-303 or § 5-65-310 shall:

**(i)** Both:

**(a)** Furnish proof of attendance at and completion of the alcohol and driving education program or alcoholism treatment program required under

subdivision (a)(1) of this section and at a victim impact panel as provided in § 5-65-121 before reinstatement of his or her suspended or revoked driver's license; and

**(b)** Pay any fee for reinstatement required under § 5-65-119, § 5-65-304, or § 5-65-121; or

**(ii)** Furnish proof of dismissal or acquittal of the charge on which the suspension or revocation is based.

**(B)** An application for reinstatement shall be made to the Office of Driver Services.

**(2)** Even if a person has filed a de novo petition for review pursuant to § 5-65-402, the person is entitled to reinstatement of driving privileges upon complying with this subsection and is not required to postpone reinstatement until the disposition of the de novo review in circuit court has occurred.

**(3) (A)** A person suspended under this subchapter may enroll in an alcohol education program prior to disposition of the offense by the circuit court, district court, or city court, but is not entitled to any refund of fees paid if the charges are dismissed or if the person is acquitted of the charges.

**(B)** A person who enrolls in an alcohol education program is not entitled to any refund of fees paid if the person is subsequently acquitted.

**(e)** Any alcohol and driving education program shall remit the fees imposed under this section to the Office of Alcohol and Drug Abuse Prevention.

**5-65-308. No probation prior to adjudication of guilt.**

**(a) (1)** Section 16-93-301 et seq. allows a circuit court judge, district court judge, or city court judge to place on probation a first offender who plead guilty or nolo contendere prior to an adjudication of guilt, and upon successful completion of probation, the circuit court judge, district court judge, or city court judge may discharge the accused without a court adjudication of guilt and expunge the record.

**(2) (A)** No circuit court judge, district court judge, or city court judge may utilize the provisions of § 16-93-301 et seq. in an instance in which an underage person is charged with violating § 5-65-303.

**(B)** Notwithstanding the provisions of § 5-4-301, § 5-4-322, or subdivision (a)(2)(A) of this section, in addition to the mandatory penalties required for a violation of § 5-65-303 a circuit court judge, district court judge, or city court judge may utilize probationary supervision solely for the purpose of monitoring compliance with his or her orders and require an offender to pay a reasonable fee in an amount to be established by the circuit court judge, district court judge, or city court judge.

**(b)** Any magistrate or judge of a court shall keep or cause to be kept a record of any violation of this subchapter presented to that court and shall keep a record of any official action by that court in reference to the violation of this subchapter, including, but not limited to, a record of any finding of guilt, plea of guilty or nolo contendere, or judgment of

acquittal, and the amount of fine and other sentence.

**(c)** Within thirty (30) days after sentencing a person who has been found guilty or pleaded guilty or nolo contendere on a charge of violating any provision of this subchapter, any magistrate of the court or clerk of the court shall prepare and immediately forward to the Office of Driver Services an abstract of the record of the court covering the case in which the person was found guilty or pleaded guilty or nolo contendere, and the abstract shall be certified by the person so required to prepare it to be true and correct.

**(d)** The abstract shall be made upon a form furnished by the office and shall include:

- (1)** The name and address of the party charged;
- (2)** The number, if any, of the driver's license of the party charged;
- (3)** The registration number of the vehicle involved;
- (4)** The date of hearing;
- (5)** The plea;
- (6)** The judgment; and
- (7)** The amount of the fine and other sentence, as the case may be.

#### **5-65-309. Implied consent.**

**(a)** Any underage person who operates a motor vehicle or is in actual physical control of a motor vehicle in this state is deemed to have given consent, subject to the provisions of § 5-65-203, to a chemical test of his or her blood, breath, or urine for the purpose of determining the alcohol or controlled substance content of his or her breath or blood if:

**(1)** The underage person is arrested for any offense arising out of an act alleged to have been committed while the underage person was driving while under the influence or driving while there was an alcohol concentration of two-hundredths (0.02) but less than eight-hundredths (0.08) in his or her breath or blood;

**(2)** The underage person is involved in an accident while operating or in actual physical control of a motor vehicle; or

**(3)** The underage person is stopped by a law enforcement officer who has reasonable cause to believe that the underage person, while operating or in actual physical control of a motor vehicle, is under the influence or has an alcohol concentration of two-hundredths (0.02) but less than eight-hundredths (0.08) in his or her breath or blood.

**(b)** Any underage person who is dead, unconscious, or otherwise in a condition rendering him or her incapable of refusal is deemed not to have withdrawn the consent provided by subsection (a) of this section, and a chemical test may be administered subject to the provisions of § 5-65-203.

#### **5-65-310. Refusal to submit.**

**(a)** **(1)** If an underage person under arrest refuses upon the request of a law

enforcement officer to submit to a chemical test designated by the law enforcement agency, as provided in § 5-65-309, no chemical test shall be given, and the underage person's driver's license shall be seized by the law enforcement officer, and the law enforcement officer shall immediately deliver to the underage person from whom the driver's license was seized a temporary driving permit, as provided by § 5-65-402.

**(2)** Refusal to submit to a chemical test under this subsection is a strict liability offense and is a violation pursuant to § 5-1-108.

**(b)** **(1)** The Office of Driver Services shall suspend or revoke the driving privileges of the arrested underage person under § 5-65-402.

**(2)** The office shall suspend the underage person's driving privileges as follows:

**(A)** Suspension for ninety (90) days for a first offense under this section;

**(B)** Suspension for one (1) year for a second offense under this section; and

**(C)** **(i)** Revocation for the third or subsequent offense occurring while the person is underage.

**(ii)** Revocation is until the underage person reaches twenty-one (21) years of age or for a period of three (3) years, whichever is longer.

**(c)** In order to determine the number of previous offenses to consider when suspending or revoking the arrested underage person's driving privileges, the office shall consider as a previous offense:

**(1)** Any conviction for violating § 5-65-310; and

**(2)** Any suspension or revocation of driving privileges for an arrest for a violation of § 5-65-310 when the person was not subsequently acquitted of the criminal charge.

**(d)** In addition to any other penalty provided for in this section, if the underage person is a resident without a license or permit to operate a motor vehicle in this state:

**(1)** The office shall deny to that underage person the issuance of a license or permit for a period of six (6) months for a first offense; and

**(2)** For a second or subsequent offense by an underage resident without a license or permit to operate a motor vehicle, the office shall deny to that underage person the issuance of a license or permit for a period of one (1) year.

**(e)** When an underage nonresident's privilege to operate a motor vehicle in this state has been suspended, the office shall notify the office of issuance of that underage person's nonresident motor vehicle license of action taken by the office.

**(f)** **(1)** **(A)** The office shall charge a reinstatement fee to be calculated as provided under subdivision (f)(1)(B) of this section for reinstating a driver's license suspended or revoked for a violation of this section.

**(B)** The reinstatement fee is calculated by multiplying twenty-five dollars

(\$25.00) by the number of offenses resulting in an administrative suspension order under § 5-65-310 unless the administrative suspension order has been removed because:

(i) The person has been found not guilty of the offense by a circuit court or district court; or

(ii) The office has entered an administrative suspension order.

(C) The fee under subdivision (f)(1)(A) of this section is supplemental to and in addition to any fee imposed by § 5-65-119, § 5-65-304, § 27-16-508, or § 27-16-808.

(2) Forty percent (40%) of the revenues derived from the reinstatement fee under this subsection shall be deposited into the State Treasury as special revenues and credited to the Public Health Fund to be used exclusively for the Blood Alcohol Program of the Department of Health.

### **5-65-311. Relationship to other laws.**

(a) A penalty prescribed in this subchapter for underage driving under the influence is in addition to any other penalty prescribed by law for the offense under another law of the State of Arkansas.

(b) For the purposes of this subchapter, there is no presumption, as there is found in § 5-65-206, that an underage person is not under the influence of an intoxicating substance, such as alcohol or a similar intoxicant, if the underage person's alcohol concentration is four hundredths (0.04) or less.

(c) The following are the same for a chemical test or instrument used for testing breath or blood alcohol concentration under the Omnibus DWI Act, § 5-65-101 et seq:

- (1) The administration of a chemical test for breath or blood alcohol;
- (2) The instrument used to administer the chemical test;
- (3) The procedure used to calibrate and maintain the instrument; and
- (4) The use of the chemical test results as evidence.

(d) If there is evidence of an alcohol concentration of more than four-hundredths (0.04) but less than eight-hundredths (0.08) in an underage person's blood, breath, or other bodily substance, this fact does not preclude the underage person from being prosecuted for driving while intoxicated under the Omnibus DWI Act, § 5-65-101 et seq.

## **6.4 12-12-300s**

### **12-12-301. Establishment.**

**(a)** There is established a State Crime Laboratory.

**(b)** The laboratory shall offer services to law enforcement in pathology and biology, toxicology, criminalistics, raw drug analysis, latent fingerprint identification, questioned documents examination, firearms and toolmarks identification, and in other such areas as the State Crime Laboratory Board may deem necessary and appropriate.

### **12-12-302. Board created -- Members -- Meetings.**

**(a)** **(1)** There is created a State Crime Laboratory Board.

**(2)** **(A)** The members of the board shall be appointed by the Governor and confirmed by the Senate.

**(B)** However, a vacancy may be temporarily filled by the Governor until the Senate shall next meet.

**(b)** The members appointed by the Governor shall be composed of:

**(1)** One (1) member of the active judiciary;

**(2)** One (1) practicing member of the legal profession;

**(3)** One (1) active county sheriff;

**(4)** One (1) active chief of police;

**(5)** One (1) active prosecuting attorney;

**(6)** Two (2) physicians engaged in the active practice of private or academic medicine; and

**(7)** One (1) member at large from the state.

**(c)** **(1)** Appointments to the board shall be for a term of seven (7) years.

**(2)** **(A)** All appointments made at any time other than the day following the expiration of a term shall be made for the unexpired portion of the term.

**(B)** If, however, the Governor shall not make an appointment by January 15 of the year in which the term expires, that member shall continue to serve until he or she is reappointed or a successor is appointed, and the term of that member shall run for seven (7) years from January 15 in the year the term expired rather than for seven (7) years from the date of actual appointment.

**(d)** **(1)** The board shall meet and elect one (1) of its members as chair and one (1) as vice chair.

**(2)** The chair shall have the power to call meetings of the board upon due notice of the meeting to all members of the board.

**(e)** A majority of the members of the board shall constitute a quorum to transact the business of the board.

**(f)** The board shall meet a minimum of one (1) time every three (3) months. Failure of any appointee to attend three (3) consecutive meetings shall constitute cause for removal from the board by the Governor.

**(g)** Members of the board may receive expense reimbursement and stipends in accordance with § 25-16-901 et seq. The sums shall be paid from the appropriated maintenance and general operations funds of the State Crime Laboratory.

### **12-12-303. Board's powers and duties generally.**

**(a)** The State Crime Laboratory Board shall promulgate such policies, rules, and regulations as shall be necessary to carry out the intent and purpose of this subchapter along with the specific duties and responsibilities set out in this subchapter.

**(b)** The board is authorized to accept gifts, grants, or funds from persons, associations, corporations, foundations, and federal or state governmental agencies and to use the gifts, grants, or funds for purposes of carrying out this subchapter or for any other purposes not inconsistent with the purposes and intent of this subchapter which may be authorized by the board.

**(c)** The board is further authorized by this subchapter to enter into contracts, not inconsistent with law, and to do such things as it may deem necessary or appropriate to properly carry out the purposes and intent of this subchapter.

### **12-12-304. Executive director.**

**(a)** The State Crime Laboratory shall be headed by an executive director who shall be appointed by the Governor.

**(b)** The Executive Director of the State Crime Laboratory may delegate specific duties to competent and qualified associates, assistants, and deputies who may act for the executive director within the scope of the authority granted him or her, subject, however, to such rules and regulations as may be prescribed by the State Crime Laboratory Board.

**(c)** The board shall prescribe the duties, responsibilities, compensation, and qualifications for the executive director.

### **12-12-305. Housing and equipment -- Functions.**

**(a)** There shall be established under the supervision of the Executive Director of the State Crime Laboratory a central office and laboratory facility sufficient and adequate to house the various functions of the laboratory as set out in this subchapter and as may be necessary and proper for the laboratory to perform in carrying out its official duties and functions as provided by law.

**(b)** The laboratory shall have such equipment and personnel as is necessary to respond to

the needs of all law enforcement agencies in the State of Arkansas with respect to the following functions:

**(1)** Forensic toxicology, which shall include, but is not limited to, chemical testing and analysis of body fluids and the performance of procedures to determine the presence and significance of toxic agents both in the investigation of death cases authorized by this subchapter and in other appropriate cases;

**(2)** Criminalistics, which shall include, but is not limited to, chemical testing of trace evidence, physical and microscopic analysis of evidence, questioned document examination and classification, latent fingerprint identification and classification, firearms and toolmarks identification and analysis, and serology;

**(3)** Drug analysis, which shall include, but is not limited to, analyzing and identifying substances suspected as being controlled, illicit, or contraband drugs;

**(4)** Pathology and biology, which shall include investigating and making a determination of the cause and manner of deaths which become subject to the jurisdiction of the State Medical Examiner as set out in § 12-12-318 and shall include the general application of the medical sciences to assist the criminal justice system in the State of Arkansas; and

**(5)** Any other laboratory divisions, sections, or functions which, in the opinion of the State Crime Laboratory Board, may serve the needs of law enforcement in the State of Arkansas for laboratory analysis.

**12-12-306. State Medical Examiner.**

**(a)** The Executive Director of the State Crime Laboratory shall appoint and employ a State Medical Examiner with the approval of the State Crime Laboratory Board.

**(b)** The executive director may remove the examiner only for cause and with the approval of the board.

**12-12-307. Medical examiners -- Qualifications -- Duties.**

**(a)** **(1)** The State Medical Examiner as well as associate medical examiners shall:

**(A)** Be citizens of the United States;

**(B)** Be physicians or surgeons with a doctor of medicine degree who have been licensed or who are eligible to be licensed to practice medicine in the State of Arkansas;

**(C)** Have a minimum of three (3) years postgraduate training in human pathology as recognized by the American Medical Association; and

**(D)** Have had at least one (1) year of experience in medical-legal practice.

**(2)** The State Medical Examiner shall also be board certified or eligible for board certification as recognized by the American Board of Pathology in Forensic Pathology.

**(b)** In addition to the duties prescribed in this subchapter, the State Medical Examiner and his or her associates may teach in the medical school, conduct classes for law enforcement officers and officials, lecture, do research, and engage in such activities as shall be deemed appropriate by the State Crime Laboratory Board.

**12-12-308. Medical examiners -- Professional liability insurance.**

**(a)** The State Crime Laboratory shall obtain a policy of professional liability insurance in the amount of no less than four hundred thousand dollars (\$400,000) to indemnify any person or persons injured by the State Medical Examiner or his or her associates in the performance of their duties under this subchapter.

**(b)** The premium for the policy of insurance shall be paid from funds appropriated by the General Assembly for the maintenance and general operations of the State Crime Laboratory.

**12-12-309. Utilization of outside personnel.**

**(a)** The State Crime Laboratory Board is empowered to authorize the Executive Director of the State Crime Laboratory to contract with the University of Arkansas for Medical Sciences, University of Arkansas for Medical Sciences Medical Center, or with other persons or institutions to obtain services with which to perform the duties set forth in this subchapter.

**(b)** The participation of the University of Arkansas for Medical Sciences faculty or of any other person in carrying out the provisions of this subchapter shall in no way affect tenure or any other status with any such institution or agency.

**12-12-310. Reimbursement for use of outside faculty.**

**(a)** The State Crime Laboratory shall reimburse the University of Arkansas for Medical Sciences Medical Center and the Graduate Institute of Technology for the use of personnel from those institutions in performing services for the laboratory.

**(b)** The participation of center faculty and institute faculty in carrying out the provisions of this subchapter shall in no way affect their tenure with their institution.

**12-12-311. Cooperation by others required -- Tort immunity.**

**(a)** **(1)** All law enforcement officers and other state, county, and city officials, as well as private citizens, shall fully cooperate with the staff of the State Crime Laboratory in making any investigation provided for or authorized in this subchapter.

**(2)** **(A)** The prosecuting attorney for each judicial district shall provide the laboratory each month with a list of cases having been adjudicated through plea negotiations and which require no further laboratory analysis.

**(B)** The monthly list shall contain the laboratory case number and will be used by the laboratory for the purpose of returning evidence on which analysis is no longer necessary, thus reducing the backlog of cases found on the evidence shelves at the laboratory.

**(3)** Nothing in this subchapter shall impair the authority of the prosecuting attorney to require further analysis of evidence in any case having been adjudicated through plea negotiations.

**(4) (A)** Upon completion of all requested analysis of submitted evidence by the laboratory, the evidence shall be returned to the submitting agency within thirty (30) days.

**(B)** The submitting agency shall maintain and store evidence until released by a court of competent jurisdiction or the prosecuting attorney.

**(b)** Any physician or other person in attendance or present at the death of a person or any hospital, if death occurs therein and results from such conditions and circumstances as set out in § 12-12-315 shall promptly notify the chief law enforcement official of the county or municipality which shall have jurisdiction and the laboratory of the death and shall assist in making available dead bodies and related evidence as may be requested by the Executive Director of the State Crime Laboratory or his or her staff or by the law enforcement agency conducting the investigation.

**(c)** Any physician, surgeon, dentist, hospital, or other supplier of health care services shall cooperate and make available to the executive director or his or her staff the records, reports, charts, specimens, or x-rays of the deceased as may be requested where death occurs and an investigation is being conducted under the provisions of this subchapter.

**(d)** No person, institution, or office in this state which shall make available information or material under this section shall be liable for violating any criminal law of this state, nor shall any person, institution, or office be held liable in tort for compliance with this section.

**12-12-312. Records confidential and privileged -- Exception -- Release.**

**(a) (1) (A) (i)** The records, files, and information kept, obtained, or retained by the State Crime Laboratory under this subchapter are privileged and confidential.

**(ii)** The records, files, and information shall be released only under and by the direction of a court of competent jurisdiction, the prosecuting attorney having criminal jurisdiction over the case, or the public defender appointed or assigned to the case.

**(B) (i)** This section does not diminish the right of a defendant or his or her attorney to full access to all records pertaining to the case.

**(ii)** The laboratory shall disclose to a defendant or his or her attorney all evidence in the defendant's case that is kept, obtained, or retained by the laboratory.

**(iii)** The Department of Health may access autopsy records, files, and information under this subchapter for the purpose of implementing the quality improvement provisions of the Trauma System Act, § 20-13-801 et seq., and the rules adopted by the State Board of Health under the Trauma System Act, § 20-13-801 et seq.

**(2)** However, a full report of the facts developed by the State Medical Examiner or his or her assistants shall be promptly filed with the law enforcement agencies, county coroner, and prosecuting attorney of the jurisdiction in which the death occurred.

**(b)** The State Crime Laboratory Board shall promulgate rules and regulations not contrary to law regarding the release of reports and information by the staff of the laboratory.

**(c)** All records, files, and information obtained or developed by the laboratory pertaining to a capital offense committed by a defendant who is subsequently sentenced to death for the commission of that offense shall be preserved and retained until the defendant's execution.

**12-12-313. Records as evidence -- Analyst's testimony.**

**(a)** The records and reports of autopsies, evidence analyses, drug analyses, and any investigations made by the State Crime Laboratory under the authority of this subchapter shall be received as competent evidence as to the matters contained therein in the courts of this state subject to the applicable rules of criminal procedure when duly attested to by the Executive Director of the State Crime Laboratory or his or her assistants, associates, or deputies.

**(b)** Nothing in this section shall be deemed to abrogate a defendant's right of cross-examination if notice of intention to cross-examine is given prior to the date of a hearing or trial pursuant to the applicable rules of criminal procedure.

**(c)** The testimony of the appropriate analyst may be compelled by the issuance of a proper subpoena, in which case the records and reports shall be admissible through the analyst who shall be subject to cross-examination by the defendant or his or her counsel, either in person or via two-way closed-circuit or satellite-transmitted television pursuant to subsection (e) of this section.

**(d)** **(1)** All records and reports of an evidence analysis of the laboratory shall be received as competent evidence as to the facts in any court or other proceeding when duly attested to by the analyst who performed the analysis.

**(2)** The defendant shall give at least ten (10) days' notice prior to the proceedings that he or she requests the presence of the analyst of the laboratory who performed the analysis for the purpose of cross-examination.

**(3)** Nothing in this subsection shall be construed to abrogate the defendant's right to cross-examine.

**(e)** Except trials in which the defendant is charged with capital murder, § 5-10-101, or murder in the first degree, § 5-10-102, in all criminal trials upon motion of the prosecutor the court may allow the prosecutor to present the testimony of the appropriate analyst by contemporaneous transmission from a laboratory facility via two-way closed-circuit or satellite-transmitted television which shall allow the examination and cross-examination of the analyst to proceed as though the analyst were testifying in the courtroom:

**(1)** After notice to the defendant;

**(2)** Upon proper showing of good cause and sufficient safeguards to satisfy all state and federal constitutional requirements of oath, confrontation, cross-examination, and observation of the witness's demeanor and testimony by the defendant, the court, and the jury; and

(3) Absent a showing of prejudice by the defendant.

**12-12-314. Fees -- Disposition.**

(a) The State Crime Laboratory shall charge certain fees in an amount to be determined by the State Crime Laboratory Board, but subject to the limitations set forth in this section for certain records, reports, and consultations by laboratory physicians and analysts, and expert witness testimony provided in the trial of civil lawsuits, as follows:

(1) A fee shall be charged for records and reports of the laboratory in a reasonable amount to be set by the board when the request for the report shall be from other than a law enforcement or criminal justice system agency;

(2) (A) A fee shall be charged in an amount to be set by the board for consultations, scientific or medical research, depositions, expert witness testimony, and travel to and from courts.

(B) The fees under subdivision (a)(2)(A) of this section shall be at a rate not to exceed two hundred twenty-five dollars (\$225) per hour or one thousand eight hundred dollars (\$1,800) per day and shall be levied against the requesting individual, agency, or organization for work done in civil cases in which laboratory personnel involvement results from the performance of duties and responsibilities under this subchapter; and

(3) A charge of up to three thousand dollars (\$3,000) for each autopsy requested by non-law enforcement officials.

(b) At no time shall any fee be levied or charge made to or against any law enforcement agency of the State of Arkansas for work performed under the provisions of this subchapter.

(c) (1) All fees collected by the laboratory for copies of autopsy reports, autopsies requested by the Federal Aviation Administration, and expenses paid employees for testimony as expert witnesses shall be deposited as a refund to expenditures.

(2) Other moneys derived from the charges provided for and authorized by this section shall be deposited into the State Treasury to the credit of the Miscellaneous Agencies Fund Account of the State General Government Fund.

**12-12-315. Notification of certain deaths.**

(a) (1) The county coroner, prosecuting attorney, and either the county sheriff or the chief of police of the municipality in which the death of a human being occurs shall be promptly notified by any physician, law enforcement officer, undertaker or embalmer, jailer, or coroner or by any other person present or with knowledge of the death if:

(A) The death appears to be caused by violence or appears to be the result of a homicide or a suicide or to be accidental;

(B) The death appears to be the result of the presence of drugs or poisons in the body;

(C) The death appears to be a result of a motor vehicle accident, or the body

was found in or near a roadway or railroad;

**(D)** The death appears to be a result of a motor vehicle accident and there is no obvious trauma to the body;

**(E)** The death occurs while the person is in a state mental institution or hospital and there is no previous medical history to explain the death, or while the person is in police custody or jail other than a jail operated by the Department of Correction;

**(F)** The death appears to be the result of a fire or an explosion;

**(G)** The death of a minor child appears to indicate child abuse prior to death;

**(H)** Human skeletal remains are recovered or an unidentified deceased person is discovered;

**(I)** Postmortem decomposition exists to the extent that an external examination of the corpse cannot rule out injury, or in which the circumstances of death cannot rule out the commission of a crime;

**(J)** The death appears to be the result of drowning;

**(K)** The death is of an infant or a minor child under eighteen (18) years of age;

**(L)** The manner of death appears to be other than natural;

**(M)** The death is sudden and unexplained;

**(N)** The death occurs at a work site;

**(O)** The death is due to a criminal abortion;

**(P)** The death is of a person where a physician was not in attendance within thirty-six (36) hours preceding death, or, in prediagnosed terminal or bedfast cases, within thirty (30) days;

**(Q)** A person is admitted to a hospital emergency room unconscious and is unresponsive, with cardiopulmonary resuscitative measures being performed, and dies within twenty-four (24) hours of admission without regaining consciousness or responsiveness, unless a physician was in attendance within thirty-six (36) hours preceding presentation to the hospital, or, in cases in which the decedent had a prediagnosed terminal or bedfast condition, unless a physician was in attendance within thirty (30) days preceding presentation to the hospital;

**(R)** The death occurs in the home; or

**(S)** **(i)** The death poses a potential threat to public health or safety.

**(ii)** Upon receiving notice of a death that poses a potential threat to public health or safety, the county coroner shall immediately notify the Department of Health.

**(2)** Nothing in this section shall be construed to require an investigation, autopsy, or inquest in any case in which death occurred without medical attendance solely because the deceased was under treatment by prayer or spiritual means in accordance with the tenets and practices of a well-recognized church or religious denomination.

**(b)** With regard to any death in a correctional facility, the county coroner and the State Medical Examiner shall be notified, and when previous medical history does not exist to explain the death, the Department of Arkansas State Police shall be notified.

**(c)** A violation of the provisions of this section is a Class A misdemeanor.

#### **12-12-316. Transportation of corpses.**

**(a)** The State Crime Laboratory is authorized to transport bodies of persons whose death is subject to the provisions of this subchapter to an appropriate place for autopsy or for any other scientific tests.

**(b) (1) (A)** The bodies of such deceased persons shall be returned to the county from which they were brought by or at the expense of the laboratory only if the State Medical Examiner determines that the cause of death was not suicide, accidental, or from natural causes.

**(B)** In cases in which the examiner determines that the cause of death was suicide, accidental, or from natural causes, the expense of transporting and returning the bodies of such deceased persons shall be borne by whomever requests the laboratory to examine the cause of death, except for cases referred under the provisions of § 12-12-315(a)(2).

**(C)** A body may be transported when authorized by the prosecuting attorney, circuit court, county sheriff, or chief of police, or upon the request of the next of kin of the deceased or the persons who may be responsible for burial, to a place other than the county of origin.

**(2)** The laboratory shall not, however, be required to provide actual transportation or the cost of transportation in excess of what would be required to return the body to the county of origin.

**(c)** The laboratory shall provide transportation or shall bear the cost of transportation at the option of the Executive Director of the State Crime Laboratory, but in no case shall the cost of transportation of dead bodies subject to the provisions of this subchapter be borne by the laboratory without the prior approval and authorization of the executive director or his or her staff.

#### **12-12-317. Death certificates.**

**(a)** The certificate of death of any person whose death is investigated under the provisions of this subchapter shall be made by the State Medical Examiner or by his or her designee or by the county coroner, whoever shall have conducted the investigation.

**(b)** However, where a postmortem examination has been performed, the certificate of death shall be made and signed by the examiner or his or her associates or assistants,

whoever shall have performed the postmortem examination.

**(c)** When a petition is filed with a court of competent jurisdiction to change the cause or manner of death listed on a death certificate which has been signed by the examiner or by his or her designee, the laboratory shall be notified of such petition, and the examiner or his or her designee shall be allowed to hear testimony presented by the petitioner and shall be given an opportunity to present evidence to the court to support the original ruling of the examiner or his or her assistant who signed the certificate.

**12-12-318. Examinations, investigations, and postmortem examinations -- Authorization and restrictions.**

**(a)** **(1)** When death occurs in such a manner or under such circumstances as described in § 12-12-315, the State Crime Laboratory shall have the power and authority to perform such functions and duties as may be provided by this subchapter.

**(2)** **(A)** The laboratory shall make examinations, investigations, or perform postmortem examinations to determine the cause of death as the Executive Director of the State Crime Laboratory or his or her staff deems necessary or as may be requested by the:

**(i)** County coroner of the county in which death occurs or is discovered;

**(ii)** Prosecuting attorney of the jurisdiction in which death occurs or is discovered;

**(iii)** Prosecuting attorney of the jurisdiction in which death occurs or is discovered;

**(iv)** Chief of police of the city in which death occurs or is discovered;

**(v)** Board of Corrections or its designee, or the Director of the Department of Correction or his or her designee if the person was in the care, custody, or control of the Department of Correction at the time of death; or

**(vi)** Director of the Department of Arkansas State Police or his or her designee.

**(B)** Deputies of elected officers enumerated in subdivision (a)(2)(A) of this section shall have no authority to request a postmortem examination by the laboratory.

**(b)** **(1)** In cases of sudden death in children between the ages of one (1) year and six (6) years with no previous major medical health problems, the State Medical Examiner, on a case-by-case basis, may delegate authority to the Arkansas Children's Hospital to perform postmortem examinations to determine the cause of death.

**(2)** **(A)** Should any such postmortem examination determine that death occurred from foul play or a criminal act, the hospital will immediately notify the chief law enforcement officer of the jurisdiction in which the death occurred and the examiner.

**(B)** In addition, the examiner will be responsible for developing guidelines to assure that proper evidentiary procedures are followed.

**(3)** For purposes of this section, the hospital's staff pediatric pathologist, meeting the criteria prescribed in § 12-12-307, shall be considered assistant medical examiner and, notwithstanding any other provisions in this section, may perform postmortem examinations as directed by a duly constituted authority.

**(c)** Postmortem examinations or investigations authorized in this section may be conducted without consent of any person.

**(d)** The executive director and his or her staff shall not, as a part of their official duties, perform any postmortem examination at the request of any private citizen or any public official other than those enumerated in this section.

**(e)** The provisions of this section shall supersede any and all other laws relating to the power and authority of the executive director or his or her staff, including the examiner, to conduct examinations, investigations, or postmortem examinations.

**(f)** **(1)** The executive director shall have the final authority on any ruling of manner of death which may become a matter of dispute between those persons authorized by this section to request a post mortem examination as described in § 12-12-315 and the examiner or his or her associates.

**(2)** The executive director shall use any and all material accumulated by the laboratory, interview all parties necessary, and consult with any medical authority necessary for him or her to make his or her decision as to the manner of death, and his or her ruling shall be final and binding as that ruling affects any documents generated and signed by any employee of the laboratory relating to manner of death.

**(3)** This subsection and the executive director's decision in no way affects or prohibits any person or agency to seek any other relief that may be available through legal channels.

**12-12-319. Embalming corpse subject to examination, investigation, or autopsy -- Penalty.**

**(a)** It shall be unlawful to embalm a dead body when the body is subject to examination by the State Medical Examiner or his or her associates, assistants, or deputies as provided for in this subchapter, unless authorized by the examiner or his or her associates, assistants, or deputies or unless authorized by the prosecuting attorney of the jurisdiction in which the death occurs to so embalm.

**(b)** When a body subject to examination by the examiner or his or her associates has been embalmed without authorization by or prior notice to the examiner or his or her associates, assistants, or deputies as provided for in this subchapter, the Executive Director of the State Crime Laboratory may, at his or her discretion, require an order from the circuit court of the jurisdiction in which death occurred before proceeding with his or her duties and responsibilities under this subchapter.

**(c)** Persons violating the provisions of this section shall be deemed guilty of a Class C misdemeanor.

**12-12-320. Autopsies -- Removal of pituitary gland.**

**(a)** The State Medical Examiner and his or her assistants may remove the pituitary gland during the course of an autopsy and donate the pituitary gland to an appropriate organization.

**(b)** However, the pituitary gland shall not be removed under the authority of this section if the next of kin or the person having the right to control the disposition of the decedent's remains objects.

**12-12-321. Autopsies -- Exhumed bodies.**

**(a)** Where death occurs under such circumstances as are set forth in § 12-12-315 and where a body has been buried without proper certification of death, it shall be the duty of the chief law enforcement official of the county or municipality in which death occurred or in which the body is buried or the State Medical Examiner, his or her associates, assistants, or deputies to notify the prosecuting attorney of the jurisdiction in which death occurred and the body is buried.

**(b)** The prosecuting attorney shall thereupon present the facts to the circuit court of the county, and the court may, by written order, require that the body be exhumed and an autopsy be performed by the State Crime Laboratory or its designee.

**(c)** A full and complete report of the facts developed by the autopsy shall be furnished to the court and the prosecuting attorney in timely fashion.

**(d)** The cost of the exhumation and for transportation to and from the place of autopsy shall be borne by the county in which the death occurred.

**12-12-322. Hazardous duty pay.**

**(a)** **(1)** The State Crime Laboratory is authorized to provide special compensation to certain employees for each full pay period of eighty (80) hours worked in a job which requires contact at crime scenes, emergency sites, or other sites where exposure to potentially hazardous substances is possible.

**(2)** It is recognized that many substances which may be encountered may create harmful health effects from either short-term or long-term exposure.

**(3)** This special pay is to compensate the employees for the increased risk of personal injury.

**(4)** The rate of pay will be one and one-half (1.5) times the regular authorized hourly pay or hourly rate of pay and will be paid only for the time while at the site of a clandestine laboratory.

**(5)** Payment will be controlled by the Executive Director of the State Crime Laboratory.

**(b)** The rate of pay for individuals who work less than a full pay period of eighty (80) hours or transfer to other work areas not defined in subsection (a) of this section, or both, will not receive any enhanced rate of pay for that or subsequent pay periods.

**(c)** This section covers employees who respond to clandestine laboratory sites for the purpose of assisting and dismantling of such laboratory sites and is limited to those employees in the position of Chief Forensic Chemist; Crime Lab Instrumentation Engineer, when performing the duties of a Forensic Chemist; Forensic Chemist; and Latent Prints Examiner.

**(d)** A monthly report shall be made to the Legislative Council describing all payments made to employees under the provisions of this section.

**12-12-323. Crime Lab Equipment Fund.**

**(a)** There is created the Crime Lab Equipment Fund on the books of the Auditor of State, the Treasurer of State, and the Chief Fiscal Officer of the State.

**(b)** The moneys in the fund shall be used by the State Crime Laboratory only for:

- (1)** The purchase of equipment;
- (2)** Operating expenses;
- (3)** Constructing and equipping regional crime laboratories; and
- (4)** The personal services and operating expenses of regional crime laboratories.

**12-12-324. Testing by State Crime Laboratory.**

**(a)** **(1)** All firearms used in the commission of a crime that come into the custody of any law enforcement agency in this state shall be delivered to the State Crime Laboratory within thirty (30) calendar days for ballistics testing.

**(2)** However, if the firearm is being used as evidence in a criminal case, then delivery shall take place within thirty (30) calendar days after the final adjudication of the criminal proceeding.

**(b)** **(1)** **(A)** The laboratory may conduct ballistics tests on all firearms received and input the resulting data into the National Integrated Ballistics Information Network of the Bureau of Alcohol, Tobacco, Firearms and Explosives.

**(B)** The ballistics tests may include, but not be limited to, firing of the weapon and electronic imaging of the bullets and casings.

**(2)** The laboratory shall coordinate with all participating agencies when investigations require the use of the National Integrated Bullet Identification Network's computer database.

**(3)** The laboratory shall provide written analysis reports and experts for testimony when feasible.

**(4)** After completion of the testing, the firearms shall be returned to the law enforcement agencies.

**(5)** When the law enforcement agency regains possession of the firearm, the law enforcement agency shall immediately notify the owner, unless the owner is prohibited by

law from possessing the firearm, that the owner may regain possession of the firearm at the offices of the law enforcement agency.

**(c)** A law enforcement agency in this state may request the assistance of the Department of Arkansas State Police in tracing a firearm.

**(d)** A firearm seized by the Arkansas State Game and Fish Commission for violation of a commission regulation is exempt from this section.

**(e)** The State Crime Laboratory Board may adopt rules for the implementation of this section, including, but not limited to, rules regarding testing and submission procedures.

**12-12-325. [Repealed.]**

**12-12-326. Autopsies -- Line-of-duty death.**

**(a)** As used in this section:

**(1)** "Eligible person" means a person with an eligibility similar to a firefighter or police officer under the Public Safety Officers' Benefits Act of 1976 or the Hometown Heroes Survivors Benefits Act of 2003, 42 U.S.C. § 3796 et seq., as appropriate;

**(2)** "Firefighter" means any member of a fire department or fire fighting unit of the Arkansas Forestry Commission, any city of the first class or city of the second class, any town, or any unincorporated rural area of this state, who actively engages in the fighting of fires on either a regular or voluntary basis; and

**(3)** "Police officer" means any law enforcement officer engaged in official duty who is:

**(A)** A member of:

**(i)** Any regular or auxiliary police force on a full-time or part-time basis; or

**(ii)** The Department of Arkansas State Police; or

**(B)** A sheriff or deputy sheriff of any county.

**(b)** A coroner or a supervisor of a firefighter, police officer, or eligible person shall promptly notify the State Medical Examiner if the firefighter, police officer, or eligible person dies in the line of duty as a result of injuries sustained in the line of duty or within twenty-four (24) hours after participating in an emergency situation.

**(c)** **(1)** **(A)** The examiner may conduct an autopsy on any firefighter, police officer, or eligible person who dies in the line of duty as a result of injuries sustained in the line of duty or within twenty-four (24) hours after participating in an emergency situation.

**(B)** The autopsy shall be sufficient to determine eligibility for benefits under the federal Public Safety Officers' Benefits Act of 1976 or the Hometown Heroes Survivors Benefits Act of 2003, 42 U.S.C. § 3796 et seq., as appropriate.

**(C)** A report of the autopsy shall be provided to the firefighter's or police

officer's commanding officer or the supervisor of the eligible person.

**(2) (A)** If the firefighter, police officer, or eligible person has agreed in writing to allow an autopsy under this section, that directive shall be followed unless the firefighter's, police officer's, or eligible person's spouse dictates otherwise after being notified of the prospective autopsy.

**(B)** If the firefighter, police officer, or eligible person has not agreed in writing to allow an autopsy under this section, the firefighter's, police officer's, or eligible person's spouse may decide whether or not an autopsy will be performed.

**(C)** If the firefighter's, police officer's, or eligible person's spouse chooses not to allow the autopsy:

**(i)** No autopsy may be performed; and

**(ii)** The body of the firefighter, police officer, or eligible person shall be released to the next of kin.

**(3) (A)** If the examiner does not perform an autopsy under this section, he or she shall provide to the firefighter's or police officer's commanding officer or the supervisor of the eligible person written notice stating the reason why an autopsy was not performed.

**(B)** The written notice under subdivision (c)(3)(A) of this section shall include a toxicology report.

## **6.5 27-23-100s**

### **27-23-113. Commercial drivers prohibited from operating with any alcohol in system.**

**(a)** No person shall:

**(1)** Consume an intoxicating beverage, regardless of its alcoholic content, or be under the influence of an intoxicating beverage, within four (4) hours before going on duty or operating, or having physical control of, a commercial motor vehicle;

**(2)** Consume an intoxicating beverage regardless of its alcohol content, be under the influence of an intoxicating beverage, or have any measured alcohol concentration or any detected presence of alcohol, while on duty, or operating, or in physical control of a commercial motor vehicle; or

**(3)** Be on duty or operate a commercial motor vehicle while the driver possesses an intoxicating beverage, regardless of its alcohol content. However, this subdivision (a)(3) does not apply to possession of an intoxicating beverage which is manifested and transported as part of a shipment.

**(b)** Any driver who is found to be in violation of the provisions of subsection (a) of this section shall be placed out-of-service immediately for a period of twenty-four (24) hours.

**(1)** The twenty-four-hour out-of-service period will commence upon issuance of an out-of-service order.

**(2)** No driver shall violate the terms of an out-of-service order issued under this section.

**(c)** A driver convicted of violating an out-of-service order is subject to disqualification under § 27-23-112, in addition to a civil penalty of:

**(1)** Not less than two thousand five hundred dollars (\$2,500) for a first conviction; and

**(2)** Not less than five thousand dollars (\$5,000) for a second or subsequent conviction.

### **27-23-114. Commercial motor vehicle driving offenses and penalties.**

**(a)** **(1)** It is unlawful and punishable as provided in this subchapter for any person who is intoxicated to operate or be in physical control of a commercial motor vehicle. The term "intoxicated" means influenced or affected by the ingestion of alcohol, a controlled substance, any intoxicant, or any combination thereof, at such measurable level so that the driver's reactions, motor skills, and judgment are substantially altered, and the driver therefore constitutes a clear and substantial danger of physical injury or death to himself and other motorists or pedestrians.

**(2)** It is unlawful and punishable as provided in this subchapter for any person to

operate or be in actual physical control of a commercial motor vehicle if at the time there was four hundredths of one percent (0.04%) or more by weight of alcohol in the person's blood as determined by a chemical test of the person's blood or breath or other body substances. For the purpose of this subchapter, there is no presumption, as there is found in § 5-65-206, that a person is not under the influence of an intoxicating substance if such person's blood alcohol concentration is five hundredths of one percent (0.05%) or less.

**(3)** It shall be unlawful and punishable as provided in this subchapter for any person operating a commercial motor vehicle to leave the scene of an accident involving the commercial motor vehicle and resulting in any injury to or death of any person, in any damage to another vehicle, whether attended or unattended, or in any damage to any fixture legally upon the highway or adjacent to a highway. The person operating a commercial motor vehicle involved in any such accident shall be under a duty to stop his or her vehicle at the scene of the accident and render the same aid and give the same information as required by § 27-53-103.

**(4)** It shall be unlawful and punishable as provided in this subchapter for any person driving a commercial motor vehicle to use a commercial motor vehicle in the commission of a felony.

**(5)** It shall be unlawful and punishable as provided in this subchapter for any person driving a commercial motor vehicle to refuse to submit to a chemical test to determine the person's blood alcohol concentration while driving a commercial motor vehicle. A person driving a commercial motor vehicle requested to submit to such a chemical test shall be warned by the law enforcement officer that a refusal to submit to the test will result in that person being disqualified from driving a commercial motor vehicle.

**(b)** Any person convicted of a violation of driving a commercial motor vehicle while intoxicated, driving a commercial motor vehicle while the person's blood alcohol concentration is four hundredths of one percent (0.04%) or more, leaving the scene of an accident involving a commercial motor vehicle driven by the person, or using a commercial motor vehicle in the commission of any felony shall be deemed guilty of a Class B misdemeanor and shall be disqualified from driving a commercial motor vehicle as specified in § 27-23-112.

**(c) (1)** A law enforcement officer having reasonable cause to believe the person to have been driving a commercial motor vehicle while intoxicated or driving a commercial motor vehicle while the person's blood alcohol concentration was four hundredths of one percent (0.04%) or more shall have the authority to administer or have administered a chemical test to determine the person's blood alcohol concentration. The chemical test authorized shall be identical to and under the same standards of the test given to persons under the Omnibus DWI Act, § 5-65-101 et seq.

**(2) (A)** At the time of an arrest under subdivision (a)(1), (a)(2), or (a)(5) of this section, the law enforcement officer shall seize the driver's license of the arrested person as provided by § 5-65-402, and the office shall disqualify the driving privileges of the arrested person as provided by § 27-23-112 under the procedure in § 5-65-402.

**(B)** The arrested person shall have the same right to administrative and

judicial review provided in § 5-65-402.

**(d) (1)** Every magistrate or judge of a court shall keep a record of every violation of this section presented to the court and shall keep a record of every official action taken by the court.

**(2)** Within thirty (30) days after a person has been found guilty, or pleaded guilty or nolo contendere on a charge of violating any provision of this section, every magistrate of the court or clerk of the court shall prepare and immediately forward to the Office of Driver Services an abstract, which shall be certified as true and correct, of the record of the court covering the case where a person was found guilty, or pleaded guilty or nolo contendere.

**(3)** The abstract shall be made on a form furnished by the office and shall include all items that the office shall determine as necessary.

**(e)** Any violation of the offenses found in subsection (a) of this section and the penalties and suspensions imposed for those violations shall be cumulative and in addition to the penalties and suspensions for any other offense or violation under a similar Arkansas motor vehicle traffic or criminal law.

**(f)** Upon determining that the driver has violated subdivision (a)(1) or (a)(2) of this section previously or has previously been convicted of violating § 5-65-103 or § 5-65-303, the court shall order an assessment of the driver's degree of repeated alcohol abuse and shall order treatment for alcohol abuse as a condition of sentencing if appropriate.

**(g)** Upon determining that the driver has violated subdivision (a)(1) or (a)(2) of this section previously or has previously been convicted of violating § 5-65-103 or § 5-65-303, the court may order the driver to perform no less than thirty (30) days of community service in lieu of imprisonment for a second offense or no less than sixty (60) days of community service in lieu of imprisonment for a third or subsequent offense.

**(h) (1) (A)** It is unlawful for a person to knowingly apply for or to obtain a commercial driver license through a fraudulent application or other illegal method.

**(B)** It is unlawful to knowingly assist or permit any other person to apply for or to obtain a commercial driver license through a fraudulent application or other illegal method.

**(C)** It is unlawful to knowingly enter false test scores or false information on any application for a commercial driver license.

**(2) (A)** A person who violates this subsection (h) is guilty of an unclassified offense and may be fined an amount not to exceed five thousand dollars (\$5,000) or imprisoned up to a year in jail, or both.

**(B)** Any fine collected under this subsection shall be remitted by the tenth day of each month to the Administration of Justice Funds Section of the Office of Administrative Services of the Department of Finance and Administration on a form provided by the Administration of Justice Funds Section of the Office of Administrative Services of the Department of Finance and Administration for deposit into the Department

of Arkansas State Police Fund.

**27-23-115. Implied consent requirements for commercial motor vehicle drivers.**

**(a)** A person who drives a commercial motor vehicle within this state shall be deemed to have given consent, subject to the provisions of § 5-65-202, to take a test or tests of that person's blood, breath, or urine for the purpose of determining that person's blood alcohol concentration or the presence of other drugs.

**(b)** A test or tests may be administered at the direction of a law enforcement officer who, after stopping or detaining the commercial motor vehicle driver, has probable cause to believe that driver was driving a commercial motor vehicle while having alcohol in his or her system. It shall be unlawful and punishable as provided in this chapter for any person so stopped or detained to refuse to submit to such test or tests to determine that person's blood alcohol concentration or the presence of other drugs.

**(c)** A person requested to submit to a test as provided in subsection (a) of this section must be warned by the law enforcement officer requesting the test that a refusal to submit to the test will result in that person's being disqualified from operating a commercial motor vehicle under § 27-23-112 and § 5-65-402.

**(d)** If the person is under arrest and refuses testing, no test shall be given, and the person's commercial driver license shall be seized by the law enforcement officer. The officer shall immediately deliver to the person whose license was seized a temporary commercial driving permit as provided by § 5-65-402 and shall cite the person for his or her refusal to submit to the test.

**(e)** The arresting officer shall remit the seized commercial driver license to the Office of Driver Services as provided by § 5-65-402.

**(f)** The office shall disqualify the person from operating a commercial motor vehicle for a period specified in § 27-23-112 under the procedure set forth in § 5-65-402, and the disqualified person shall have the same right to administrative and judicial review provided by § 5-65-402.