OSAC 2021-N-0026
Standard for Education and Training of Forensic Toxicology Personnel

Forensic Toxicology Subcommittee
Seized Drugs and Toxicology SAC
Organization of Scientific Area Committees (OSAC) for Forensic Science
Draft OSAC Proposed Standard

OSAC 2021-N-0026
Standard for Education and Training of Forensic Toxicology Personnel

Prepared by
Forensic Toxicology
Version: 1.0
July 2021

Disclaimer:

This OSAC Proposed Standard was written by the [insert subcommittee or other unit name] of the Organization of Scientific Area Committees (OSAC) for Forensic Science following a process that includes an open comment period. This Proposed Standard will be submitted to a standards developing organization and is subject to change.

There may be references in an OSAC Proposed Standard to other publications under development by OSAC. The information in the Proposed Standard, and underlying concepts and methodologies, may be used by the forensic-science community before the completion of such companion publications.

Any identification of commercial equipment, instruments, or materials in the Proposed Standard is not a recommendation or endorsement by the U.S. Government and does not imply that the equipment, instruments, or materials are necessarily the best available for the purpose.
Foreword

This document was developed to provide the minimum requirements for educational qualifications, training, competency, experience, continuing education, and certification of laboratory personnel performing or overseeing forensic toxicology analysis and breath alcohol instrument calibration. This standard was developed by the Forensic Toxicology Subcommittee of the Organizational Scientific Area Committees.
Table of Contents

1. Scope 5
2. Normative References 5
3. Terms and Definitions 5-6
4. Minimum Standards 7-11

Annex A 12-13
Annex B 13
Bibliography 13
1 **Scope**

This document provides minimum requirements for educational qualifications, training, competency, experience, continuing education, and certification of laboratory personnel performing or overseeing forensic toxicology analysis and breath alcohol instrument calibration. This applies to the following sub-disciplines: postmortem toxicology, human performance toxicology (e.g., drug-facilitated crimes and driving-under-the-influence of alcohol or drugs) and other forensic testing (e.g., court-ordered toxicology, general forensic toxicology). Laboratory personnel that exclusively perform administrative or non-technical duties are outside the scope of this document. This document does not address proficiency testing or requirements of specific professional certification and licensing bodies.

2 **Normative References**

N/A

3 **Terms and Definitions**

For purposes of this document, the following definitions and acronyms apply.

**Analyst** - An individual (however named) who conducts, directs or reviews the analysis of forensic toxicology samples, evaluates data\(^1\) and reaches conclusions;\(^2\) may sign a report for court or investigative purposes as a consequence of such examinations. This person does not provide interpretive opinions related to the results of toxicological tests.

1 “Evaluates data” refers to the evaluation of scientific data to meet reporting criteria.

2 “Reach conclusions” refers to the decision to report the substance as detected and quantify, if applicable, or not detected and submit those findings for review.

**Breath Alcohol Program** – An organizational structure including policies, procedures, responsibilities and resources necessary for implementing core breath alcohol activities. The program includes, but may not be limited to, requirements or specifications for reference materials, training of operators, maintenance and calibration of instrumentation, the evidential breath alcohol test sequence, and record retention.

**Certification** – The recognition by an independent certifying body that an individual has acquired and demonstrated specialized knowledge, skills, and abilities.

**Competency** – The demonstration of technical skills and knowledge necessary to perform forensic analysis successfully.

**Continuing Education** - Ongoing training whereby personnel remain current, or advance to a higher level of expertise, specialization, or responsibility.
Course – An officially recognized program of instruction that is taught through an accredited college or university program in which the student’s successful completion is documented by an official record of the institution.

Credential – A formal recognition of a professional’s knowledge, skills, and abilities (e.g., diploma, license).

Education – Formal coursework at an accredited college or university.

Experience – Direct observation of and participation in the practice of a discipline.

Laboratory Personnel – Individuals who perform analytical or laboratory-based functions of a technical nature. This excludes administrative or non-technical support staff.

Methodology – The analytical processes and procedures used to support forensic toxicology (e.g., chromatography, spectroscopy or immunoassay).

Professional Development – The education and training that contributes to career advancement and succession planning (e.g., administration, leadership, management and fiscal responsibility).

Qualifications – The combined education, training, and experience of an individual.

Reference Material – A material or substance, sufficiently homogenous, stable, and of known concentration with respect to one or more specified properties, which has established to be fit for its intended use in a measurement process.

Technician – An individual (however named) who performs basic analytical functions but does not evaluate data, reach conclusions or sign a report for court or investigative purposes.

Toxicologist – An individual (however named) who provides factual information and/or interpretive opinions related to the results of toxicological tests for court or investigative purposes. May be further defined by role [e.g., Toxicologist (General), Toxicologist (Alcohol), Toxicologist (Breath Alcohol)] .

Toxicology Supervisor – An individual (however named) who is responsible for the technical and administrative oversight of the toxicology laboratory.

Training – The formal, structured process of teaching and assessment, through which personnel reach a level of scientific knowledge and expertise required to perform specific tasks.

4. Minimum requirements for Personnel

4.1 Educational Qualifications

One indication of professional standing is educational qualifications. Diplomas and formal academic transcripts are required as proof of academic credentials.
Minimum standards for education are summarized in Annex A for each category of employment. Core scientific topics are listed in Annex B.

4.1.1 Technician: Associates degree in Natural Science, Applied Science, or Technology from an accredited institution.

4.1.2 Analyst: Bachelor's degree in Natural Science (Preference in Chemistry, Toxicology, Biochemistry, Pharmacology, or Biology) or Applied Science (Forensic Science, Medical Sciences) from an accredited institution; completion of general and organic chemistry with associated laboratory classes.

4.1.3 Toxicologist: Bachelor's degree in Natural Science (Preference in Chemistry, Toxicology, Biochemistry, Pharmacology, or Biology) or Applied Science (Forensic Science, Medical Sciences) from an accredited institution; completion of general and organic chemistry with associated laboratory classes; at least one (1) college-level course from Column A and one (1) from Column B located in Appendix B. Supplemental trainings (40-hour course or time equivalent to 3 credit courses) can be substituted for interpretive coursework.

4.1.4 Toxicology Supervisor: Bachelor's degree in Natural Science (Preference in Chemistry, Toxicology, Biochemistry, Pharmacology, or Biology) or Applied Science (Forensic Science, Medical Sciences) from an accredited institution; completion of general and organic chemistry with associated laboratory classes; at least one (1) college-level course from Column A and one (1) from Column B located in Annex B. Supplemental trainings (40-hour course or time equivalent to 3 credit courses) can be substituted for interpretive coursework.

4.2 Training, Experience, & Competency

Personnel require training to build competency. The length of the initial training provided to the individual depends upon the scope of work to be performed, as well as the qualifications of the individual. The depth of training is appropriate to the job function(s). Regardless of qualifications, all technical personnel are provided training to ensure competency in all assigned areas detailed in the training elements section. Prior to assuming independent responsibility, personnel must successfully demonstrate competency in their job function(s).

Minimum standards for training and experience are summarized in Annex A for each category of employment.

4.2.1 Training and Experience

The source of training can be internal and/or external to the forensic laboratory. Training partnerships are valuable because they provide broad perspectives and facilitate consistency of professional practice. Sources include government agencies, academic institutions, training academies or institutions, private sector organizations, manufacturers, professional societies, and mentors.
4.2.1.1 Training Program: The laboratory shall have a documented training program which must address both theoretical and practical knowledge, skills and abilities necessary to perform job functions. Documentation of completion of the elements of the training program are retained. The relevance and content of the training program shall be evaluated by the organization annually.

4.2.1.1.1 Training Elements: Specific training elements shall include the following areas where applicable for the specific job duties as summarized below:

<table>
<thead>
<tr>
<th>Element</th>
<th>Suggested Training Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrative and Laboratory Policies</td>
<td>Accreditation; Document and record control; Method validation; Quality management; Safety and security (Biological, chemical, and physical hazards; Security); Standard operating procedures</td>
</tr>
<tr>
<td>Alcohol toxicology</td>
<td>Interpretation (Mathematical calculations); Pharmacodynamics; Pharmacokinetics; Physiology (Blood to breath ratio)</td>
</tr>
<tr>
<td>Analytical Methodology</td>
<td>Aliquoting; Isolation techniques; Qualitative analysis; Quantitative analysis; Theory</td>
</tr>
<tr>
<td>Calibrating device</td>
<td>Dry gas cylinder (Barometric pressure; Theory; Uses/limitations; Wet/dry offset); Wet bath simulator (Partition ratio; Temperature; Theory; Uses/limitations)</td>
</tr>
<tr>
<td>Communication</td>
<td>Report writing; Verbal and nonverbal skills (Non-technical; Technical)</td>
</tr>
<tr>
<td>Evidence</td>
<td>Chain of custody; Collection; Concepts; Preservation; Retention</td>
</tr>
<tr>
<td>Human Factors</td>
<td>Factors such as bias that may affect analytical results and interpretations</td>
</tr>
<tr>
<td>Instructional development</td>
<td>Adult learning principles; Knowledge and/or development of curriculum; Use of assigned multi-media equipment</td>
</tr>
<tr>
<td>Instrumentation</td>
<td>History; Limitations; Maintenance and troubleshooting; Operation; Technical functions (adjustment/calibration); Testing functions; Theory</td>
</tr>
<tr>
<td>Legal aspects</td>
<td>Applicable federal, state, or local laws and rules (regulations); Case law; Terminology; Testimony (Courtroom procedure; Deposition and courtroom)</td>
</tr>
<tr>
<td>Quality control</td>
<td>Reference Material (Uses/Limitations; Preparation; Traceability); Theory</td>
</tr>
<tr>
<td>Standards of conduct</td>
<td>Ethics; Professionalism</td>
</tr>
<tr>
<td>Statistical analysis</td>
<td>Calculations; Control charts and/or trending; Measurement assurance; Measurement uncertainty;</td>
</tr>
</tbody>
</table>
4.2.1.2 Experience

Experience is a component of building competency prior to performing the job function. Experience includes both practical and theoretical aspects of the discipline.

Minimum standards for training and experience are summarized in Annex A for each category of employment.

4.2.2 Competency

4.2.2.1 Initial Competency: Regardless of academic qualifications or past work experience, all individuals shall satisfactorily complete a competency assessment prior to assuming independent responsibilities. The format for initial competency assessment(s) are specified in the training program (see Section 4.2.1). The program may use different formats such as oral, written, and video as a means of ensuring and documenting competency. Verification document(s) demonstrating that personnel achieved the required competence must be maintained by the laboratory.

4.2.2.2 Ongoing Competency: The laboratory shall monitor competency of personnel on a continuous basis, documented annually. Competency shall be assessed at the appropriate level commensurate with job duties. The laboratory shall establish a predetermined, acceptable level of performance. The laboratory shall establish remediation and corrective action plans when expected outcome(s) are not achieved.

4.3 Certification

Certification provides the public and the judicial system a means of identifying those practitioners who successfully demonstrate competency. It provides an additional means of verifying ethical standards and is an external review of ongoing competency.

Standards for Certification Bodies include: A formal application process, verification of minimum educational qualifications, review of official transcript(s) from an accredited college or university sent directly to the certification body, review professional references from practitioners with knowledge of the applicant’s experience in forensic toxicology submitted directly to the certification body, verification of required training and experience, statement of adherence to a professional code of conduct, and perform a proctored written examination appropriate to the level of certification. Certification bodies shall predefine criteria for successful completion, have a periodic requalification process and a process to reapply for certification in the event an individual does not qualify.
Minimum standards for training and experience are summarized in Annex A for each category of employment.

4.4 Continuing Education

All laboratory personnel have an ongoing obligation to remain current within the discipline through continuing education and professional development activities appropriate for the scope of job functions. While casework is the primary focus, individuals should also strive to advance the profession. This may be accomplished through professional involvement such as research, mentoring, teaching, participating in professional organizations, scientific publications and other professional activities. Recognition of any continuing education or professional development requires proper documentation. The laboratory is responsible for maintaining permanent, official training records. Assignment of CE credit for various activities is the purview of the respective Certification Bodies.

The laboratory and/or personnel shall maintain documentation of attendance through a mechanism such as certificates of completion, duration of training, program agenda/syllabi, travel documentation (if applicable). The activities must be independently verifiable and may include attending seminars, conferences, coursework, professional meetings or documented training sessions/classes in relevant subject areas. Continuing education activities also include an individual’s contribution to the field of forensic toxicology. Examples include presentations, publications in peer-reviewed literature, or authorship of books or chapters. Continuing education and professional development is a combination of internal and external activities. The sources of external continuing education and professional development are diverse (e.g., government agencies, academic institutions, training academies or institutions, private sector organizations, professional societies, vendors). Continuing education and professional development can be delivered in-person or online. Continuing education and professional development from organizations that provide recognized continuing education credits are preferred.

It is the responsibility of the laboratory to ensure that the following resources shall be available and accessible to laboratory personnel: Reference texts in key subject areas (e.g., analytical chemistry, toxicology, pharmacology), reference literature containing physical, chemical, pharmaceutical and/or analytical data, and relevant periodicals and peer-reviewed journals. Laboratory management has an ongoing responsibility to provide support and opportunities for continuing education and professional development.

Minimum standards for training and experience are summarized in Annex A for each category of employment.
### ANNEX A

<table>
<thead>
<tr>
<th></th>
<th>Technician*</th>
<th>Analyst*</th>
<th>Toxicologist*</th>
<th>Toxicology Supervisor*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Scope</strong></td>
<td>Performs basic analytical functions but does not evaluate data, reach conclusions or sign a report for court or investigative purposes. May also perform functions related to instrumentation including maintenance, verification, adjustment, calibration, and other activities.</td>
<td>Conducts, directs or reviews the analysis of forensic toxicology samples, evaluates data and reaches conclusions; may sign a report for court/investigative purposes based on examinations. The analyst may testify but does not provide interpretive opinions. Duties and responsibilities may also include those of a Technician.</td>
<td>Provides interpretive opinions related to the results of toxicological tests for court or investigative purposes. Duties and responsibilities may also include those of an Analyst.</td>
<td>Responsible for the technical and administrative oversight of the toxicology or breath laboratory. Duties and responsibilities may also include those of a Toxicologist.</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td>Associates degree in Natural Science, Applied Science, or Technology</td>
<td>Bachelor’s degree in Natural Science (Preference in Chemistry, Toxicology, Biochemistry, Pharmacology or Biology) or Applied Science (Forensic Science, Medical Sciences)</td>
<td>Bachelor’s degree in Natural Science (Preference in Chemistry, Toxicology, Biochemistry, Pharmacology or Biology) or Applied Science (Forensic Science, Medical Sciences)</td>
<td>Bachelor’s degree in Natural Science (Preference in Chemistry, Toxicology, Biochemistry, Pharmacology or Biology) or Applied Science (Forensic Science, Medical Sciences)</td>
</tr>
<tr>
<td><strong>Required Courses</strong></td>
<td>Chemistry (6 semester h)</td>
<td>General &amp; organic chemistry (16 semester h).</td>
<td>General &amp; organic chemistry (16 semester h), 1 analytical and 1 interpretive course.</td>
<td>General &amp; organic chemistry (16 semester h), 1 analytical and 1 interpretive course.</td>
</tr>
<tr>
<td><strong>Supplemental trainings</strong></td>
<td>N/A</td>
<td>N/A</td>
<td>Supplemental training (40-hour course) can be substituted for interpretive coursework.</td>
<td>Supplemental training (40-hour course) can be substituted for interpretive coursework.</td>
</tr>
<tr>
<td><strong>Training and Experience</strong></td>
<td>Completion of formal, structured training program appropriate to job function</td>
<td>Completion of formal, structured training program appropriate to job function</td>
<td>Completion of formal, structured training program appropriate to job function</td>
<td>Completion of formal, structured training program and 5 years experience</td>
</tr>
<tr>
<td><strong>Certification</strong></td>
<td>Not required</td>
<td>Preferred</td>
<td>Preferred</td>
<td>Required</td>
</tr>
</tbody>
</table>
**Standard for Education and Training of Forensic Toxicology Personnel**

<table>
<thead>
<tr>
<th>Continuing Education</th>
<th>Sufficient to maintain certification or 8 hours relevant to forensic toxicology with 2 hour from external sources.</th>
<th>Sufficient to maintain certification or 16 hours relevant to forensic toxicology with 4 hour from external sources.</th>
<th>Sufficient to maintain certification</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 hours relevant to job function with 1 hour from external sources.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*An individual (however named) who fulfills scope.*

**ANNEX B**

<table>
<thead>
<tr>
<th>Column A – Analytical science courses</th>
<th>Column B – Interpretive science courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analytical chemistry</td>
<td>Biochemistry</td>
</tr>
<tr>
<td>Chemical informatics</td>
<td>Drug metabolism</td>
</tr>
<tr>
<td>Instrumental analysis</td>
<td>Forensic toxicology</td>
</tr>
<tr>
<td>Mass spectrometry</td>
<td>Medicinal chemistry</td>
</tr>
<tr>
<td>Quantitative analysis</td>
<td>Pharmacology</td>
</tr>
<tr>
<td>Separation science</td>
<td>Physiology</td>
</tr>
<tr>
<td>Spectroscopic analysis</td>
<td>Toxicology</td>
</tr>
<tr>
<td>Supplemental training (40-hour course)</td>
<td></td>
</tr>
</tbody>
</table>

**Bibliography**

1. Scientific Working Group for Forensic Toxicology (SWGTOX) Standard for Laboratory Personnel
2. Scientific Working Group for Forensic Toxicology (SWGTOX) Standard for Breath Alcohol Personnel