ASB Standard 121, Second Edition
202X

Standard for the Analytical Scope and Sensitivity of Forensic Toxicological Testing of Urine and Blood in Drug-Facilitated Crime Investigations

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Foreword

Drug-facilitated crimes (DFC) are a public health and safety concern, and specialized forensic toxicological testing is a critical component of these investigations. Urine is typically the specimen of choice, as it may extend the window of drug detection; however, blood can provide additional interpretive information. This document promotes standardization of the analytical scope and sensitivity of forensic toxicological testing of urine and blood in DFC cases.

This second edition of ANSI/ASB Standard 121 updates and expands the original 2021 standard on the analytical scope and sensitivity of forensic toxicological testing in drug-facilitated crime investigations. The first edition focused exclusively on minimum target analytes and analytical sensitivity for urine, whereas this edition incorporates blood testing by establishing corresponding minimum analyte panels and performance limits for blood specimens, when tested. In addition, the required and recommended analyte lists and concentration thresholds have been revised to reflect emerging drug trends, updated pharmacokinetic data from single-dose studies, and recent recommendations from professional bodies such as the Society of Forensic Toxicologists (SOFT). The standard also clarifies timing guidance for specimen collection and reinforces expectations for laboratories to periodically reassess their testing scope based on regional trends.

The American Academy of Forensic Sciences established the Academy Standards Board (ASB) in 2015 with a vision of safeguarding Justice, Integrity and Fairness through Consensus Based American National Standards. To that end, the ASB develops consensus based forensic standards within a framework accredited by the American National Standards Institute (ANSI), and provides training to support those standards. ASB values integrity, scientific rigor, openness, due process, collaboration, excellence, diversity and inclusion. ASB is dedicated to developing and making freely accessible the highest quality documentary forensic science consensus standards, guidelines, best practices, and technical reports in a wide range of forensic science disciplines as a service to forensic practitioners and the legal system.

This document was revised, prepared, and finalized as a standard by the Toxicology Consensus Body of the AAFS Standards Board. The draft of the first edition of this standard was developed by the Toxicology Subcommittee of the Organization of Scientific Area Committees (OSAC) for Forensic Science.

Questions, comments, and suggestions for the improvement of this document can be sent to AAFS-ASB Secretariat, or 410 N 21st Street, Colorado Springs, CO 80904.

All hyperlinks and web addresses shown in this document are current as of the publication date of this standard.

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Keywords: *drug-facilitated crimes; drug-facilitated sexual assaults; scope of analytical testing; analytical sensitivity; forensic toxicology*

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Standard for the Analytical Scope and Sensitivity of Forensic Toxicological Testing of Urine and Blood in Drug-Facilitated Crime Investigations

1 Scope

This document delineates the minimum requirements for target analytes and analytical sensitivity in forensic toxicology testing of urine specimens collected from individuals associated with drug-facilitated crimes (DFC). It also provides requirements and recommendations for the testing of blood specimens from these individuals. This document does not address the analysis of other specimens or physical evidence collected in DFC cases.

2 Normative References

The following reference is indispensable for the application of this standard. The latest edition of the document (including any amendments) applies.

ANSI/ASB 113, *Standard for Identification Criteria in Forensic Toxicology* [a]

ASB Technical Report 208, *Forensic Toxicology: Terms and Definitions* [a]

3 Terms and Definitions

For purposes of this document, there are no additional terms or definitions beyond those that are defined in ASB Technical Report 208, *Forensic Toxicology: Terms and Definitions*.

4 Requirements and Recommendations for Forensic Toxicological Testing in Investigations of Drug-Facilitated Crime

4.1 Requirements for Urine Specimens

NOTE Urine specimens are generally the preferred specimens to test in DFC investigations.

4.1.1 Urine specimens collected within 120 hours of the incident shall be tested.

NOTE Case-specific circumstances may warrant testing specimens collected beyond the 120-hour window.

4.1.2 Urine specimens shall be hydrolyzed prior to analysis to capture the total amount of metabolite.

4.1.3 The scope of toxicological testing of urine specimens shall include, at a minimum, the analytes listed in Table 1.

4.1.4 Analytical sensitivity shall be equal to or lower than the concentrations listed in Table 1.

[a] Available from https://www.aafs.org/academy-standards-board.

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4.2 Recommendations and Requirements for Blood Specimens

NOTE Blood specimens are generally analyzed after urine specimens test positive for one or more drugs in DFC investigations.

4.2.1 Blood specimens collected within 24 hours of the incident should be tested.

NOTE Case-specific circumstances may warrant testing specimens collected beyond the 24-hour window.

4.2.2 When blood specimens are tested, the scope of testing shall include, at a minimum, the analytes listed in Table 2.

4.2.3 When blood specimens are tested, the analytical sensitivity shall be equal to or lower than the concentrations listed in Table 2.

4.2.4 Blood specimens should include quantitative analysis.

4.3 Additional Requirements and Recommendations

4.3.1 Laboratories shall meet the requirements of ANSI/ASB 113, *Standard for Identification Criteria in Forensic Toxicology*.

4.3.2 Laboratories shall meet the required analytical scope and sensitivity by testing internally, outsourcing the testing, or a combination of both.

4.3.3 Laboratories shall have procedures to address the testing of additional specimens (e.g., hair, vomitus) when applicable.

4.3.4 Laboratories should include other potentially impairing substances based on case histories, when available.

4.3.5 Laboratories shall assess, at least every two years, whether to add or remove other potentially impairing substances to their scope of testing based on regional drug trends.

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Table 1 – Required Minimum Analytical Scope and Sensitivity for Testing of Urine in Drug-Facilitated Crime Investigations

NOTE These minimum concentrations are aligned, where applicable, with the Society of Forensic Toxicologists (SOFT) *Recommended Minimum Performance Limits for Common DFC Drugs and Metabolites in Urine Samples.*

Analyte	Concentration
High-Dose Sedatives	
Ethanol (g/dL)[b]	0.01
Gamma hydroxybutyrate (µg/mL)[c]	10
Antidepressants (ng/mL)	
Amitriptyline	10
Chlorophenylpiperazine (Trazodone metabolite)	10
Nortriptyline	10
Antihistamines (ng/mL)	
Chlorpheniramine	10
Diphenhydramine	10
Doxylamine	10
Hydroxyzine	10
Cetirizine	10
Norchlorcyclizine	10
Promethazine	10
Tetrahydrozoline	10
Barbiturates (ng/mL)	
Butalbital	100
Phenobarbital	100
Benzodiazepines (ng/mL)	
α-hydroxyalprazolam	5
α-hydroxytriazolam	5
7-aminoclonazepam	5
7-aminoflunitrazepam	5
Lorazepam	5
Nordiazepam	10
Oxazepam	10
Temazepam	10
Cannabinoids	
11-nor-9-carboxy-Δ9-tetrahydrocannabinol (Δ9-THC-COOH)	10

Analyte	Concentration
CNS Stimulants (ng/mL)	
Amphetamine	25
Cocaethylene	25
Methamphetamine	25
3,4-Methylenedioxy-amphetamine (MDA)	25
3,4-Methylenedioxy-methamphetamine (MDMA)	25
Benzoylecgonine	50
Miscellaneous (ng/mL)	
Dextromethorphan[d]	10
Norketamine	10
Zolpidem carboxylic acid	10
Zopiclone	10
Cyclobenzaprine	10
Meprobamate	100
Gabapentin	100
Opioids (ng/mL)	
Fentanyl	1
Norfentanyl	1
Norbuprenorphine	1
Codeine	10
2-ethylidene-1,5-dimethyl-3,3-diphenylpyrrolidine (EDDP)	10
Hydrocodone	10
Hydromorphone	10
Morphine	10
Oxycodone	10
Oxymorphone	10
Tramadol	10
O-desmethyltramadol	10

[b] If more than 24 hours have elapsed between the alleged incident and urine collection, testing is not required.

[c] If more than 12 hours have elapsed between the alleged incident and urine collection, testing is not required.

[d] Isomeric differentiation is not required.

Table 2 – Required Minimum Analytical Scope and Sensitivity for Testing of Blood in Drug-Facilitated Crime Investigations

NOTE These minimum concentrations are based on single-dose studies. Most are not expected to be detectable for more than 12 to 24 hours.

Analyte	Concentration
High-Dose Sedatives	
Ethanol (g/dL)[e]	0.01
Gamma hydroxybutyrate (µg/mL)[f]	2
Antidepressants (ng/mL)	
Amitriptyline	10
Nortriptyline	10
Trazodone	50
Antihistamines (ng/mL)	
Promethazine	5
Chlorpheniramine	10
Diphenhydramine	10
Hydroxyzine	10
Tetrahydrozoline	10
Doxylamine	20
Norchlorcyclizine	20
Barbiturates (ng/mL)	
Butalbital	1000
Phenobarbital	1000
Benzodiazepines (ng/mL)	
Clonazepam	2
Flunitrazepam	2
7-aminoflunitrazepam	2
Triazolam	2
Alprazolam	5
7-aminoclonazepam	5
Lorazepam	5
Diazepam	20
Nordiazepam	20
Oxazepam	20
Temazepam	20
Cannabinoids (ng/mL)	
Δ9-tetrahydrocannabinol (Δ9-THC)	1
11-nor-9-carboxy-Δ9-tetrahydrocannabinol (Δ9-THC-COOH)	5
CNS Stimulants (ng/mL)	
Amphetamine	5
Cocaine	5
Cocaethylene	5
Methamphetamine	5
3,4-Methylenedioxy-amphetamine (MDA)	5
3,4-Methylenedioxy-methamphetamine (MDMA)	5
Benzoylecgonine	10
Miscellaneous (ng/mL)	
Cyclobenzaprine	5
Dextromethorphan[g]	2
Zolpidem	5
Zopiclone	5
Ketamine	20
Carisoprodol	200
Meprobamate	500
Gabapentin	500
Opioids (ng/mL)	
Fentanyl	0.5
Buprenorphine	0.5
Codeine	5
Hydrocodone	5
Hydromorphone	5
Morphine	5
Oxycodone	5
Oxymorphone	5
Methadone	10
Tramadol	10
O-desmethyltramadol	10

[e] If more than 24 hours have elapsed between the alleged incident and blood collection, testing is not required.

[f] If more than 12 hours have elapsed between the alleged incident and blood collection, testing is not required.

[g] Isomeric differentiation is not required.

Annex A
(informative)

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The following bibliography is not intended to be an all-inclusive list, review, or endorsement of literature on this topic. The goal of the bibliography is to provide publications cited informationally, and publications relevant to the standard.

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