

ANSI/ASB Standard 121, First Edition
2021

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



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

ASB Approved May 2021

ANSI Approved September 2021



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Colorado Springs, CO 80904

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Foreword

Drug-facilitated crimes (DFC) are a public health and safety concern and specialized toxicological testing is a critical part of these investigations. Urine is typically the specimen of choice as it may extend the window of drug detection up to 120 hours (5 days) after the alleged incident. This document promotes standardization of the analytical scope and sensitivity of forensic toxicological testing of urine in DFC cases. This document is adapted from the Society of Forensic Toxicologists (SOFT) document entitled *Recommended Minimum Performance Limits for Common DFC Drugs and Metabolites in Urine Samples*. These requirements were developed based on the current prevalence and availability of drugs in the United States. For example, flunitrazepam (Rohypnol) was excluded because of its relative unavailability in the United States.

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

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

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

1 Scope

This document delineates the minimum requirements for target analytes and analytical sensitivity for the forensic toxicological testing of urine specimens collected from alleged victims of drug-facilitated crimes (DFC). This document does not cover the analysis of blood and other evidence that may be collected in DFC cases.

2 Normative References

There are no normative reference documents. Annex A, Bibliography, contains informative references.

3 Terms and Definitions

For purposes of this document, the following definitions apply.

3.1

analytical scope

A selection of drugs, drug metabolites, and other chemicals covered in an analytical testing scheme.

3.2

analytical sensitivity

The lowest amount of an analyte that can be reliably measured in a specimen by a laboratory test; may be a decision point, a limit of detection, or a lower limit of quantitation.

3.3

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.

3.4

drug-facilitated crime

DFC

When an individual is victimized while mentally or physically incapacitated due to the effects of ethanol and/or other drugs.

3.5

limit of detection

An estimate of the lowest concentration of an analyte in a sample that can be reliably differentiated from blank matrix and identified by the analytical method.

3.6

lower limit of quantitation

An estimate of the lowest concentration of an analyte in a sample that can be reliably measured with acceptable bias and precision.

4 Requirements for Forensic Toxicological Testing of Urine Specimens in Investigations of Drug-Facilitated Crime

4.1 A urine specimen collected from an alleged victim of DFC within 120 hours of the incident shall be tested. Case-specific circumstances may warrant testing of specimens collected past 120 hours.

4.2 Toxicological testing of urine specimens collected from alleged victims of DFCs shall include, at a minimum, the compounds listed in Table 1. Analytical sensitivity shall meet or exceed (be lower than) the concentrations listed in Table 1. The table reflects total concentrations, which may be achieved via hydrolysis or direct analysis of conjugated compounds.

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

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

4.5 Laboratories should consider other potentially impairing substances based on factors such as regional drug trends and case histories.

Table 1—Required Minimum Analytical Scope and Sensitivity for Testing of Urine in Drug-Facilitated Crime Investigations¹

Analyte	Concentration
High-Dose Sedatives	
Ethanol (alcohol) ²	0.01 g/dL
Gamma hydroxybutyrate (GHB) ³	10 µg/mL
Antidepressants	
Amitriptyline	10 ng/mL
Chlorophenylpiperazine (Trazodone metabolite)	10 ng/mL
Desipramine	10 ng/mL
Imipramine	10 ng/mL
Nortriptyline	10 ng/mL
Antihistamines	
Brompheniramine	10 ng/mL
Chlorpheniramine	10 ng/mL
Diphenhydramine	10 ng/mL
Doxylamine	10 ng/mL
Norchlorcyclizine	10 ng/mL
Barbiturates	
Butalbital	100 ng/mL
Phenobarbital	100 ng/mL
Benzodiazepines	
α-hydroxyalprazolam	5 ng/mL
7-aminoclonazepam	5 ng/mL
Lorazepam	5 ng/mL
Nordiazepam	10 ng/mL
Oxazepam	10 ng/mL
Temazepam	10 ng/mL
Cannabinoids	
Carboxy-tetrahydrocannabinol (THC-COOH)	10 ng/mL

Analyte	Concentration
CNS Stimulants	
Amphetamine	25 ng/mL
Methamphetamine	25 ng/mL
Methylenedioxyamphetamine (MDA)	25 ng/mL
Methylenedioxymethamphetamine (MDMA)	25 ng/mL
Benzoylcegonine	50 ng/mL
Miscellaneous	
Cyclobenzaprine	10 ng/mL
Methorphan	10 ng/mL
Norketamine	10 ng/mL
Zolpidem carboxylic acid	10 ng/mL
Zopiclone	10 ng/mL
Carisoprodol	100 ng/mL
Meprobamate	100 ng/mL
Opioids	
Fentanyl	1 ng/mL
Norfentanyl	1 ng/mL
Codeine	10 ng/mL
Hydrocodone	10 ng/mL
Hydromorphone	10 ng/mL
Morphine	10 ng/mL
Oxycodone	10 ng/mL
Oxymorphone	10 ng/mL
Tramadol	10 ng/mL

¹ All are total drug concentrations; ² If more than 24 hours has passed between the alleged incident and urine collection, testing is not required; ³ If more than 12 hours has passed between the alleged incident and urine collection, testing is not required.

Annex A (informative)

Bibliography

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 examples of publications addressed in the standard.

- 1] Anderson, L.J. Flynn, A. and Pilgrim, J.L. "A Global Epidemiological Perspective on the Toxicology of Drug-Facilitated Sexual Assault: A Systematic Review." *Journal of Forensic Legal Medicine*, 2017, Volume 47, pp. 46-54.
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- 6] United Nations Office on Drugs and Crime (UNODC). *Guidelines (for the forensic analysis of drugs facilitating sexual assault and other criminal acts*. December 2011^c.

^a Available from: http://www.soft-tox.org/files/DFSA_Fact_Sheet.pdf. Accessed 19 August 2019

^b Available from: http://www.SOFT-Tox.org/files/MinPerfLimits_DFC2017.pdf

^c Available from: https://www.unodc.org/documents/scientific/forensic_analys_of_drugs_facilitating_sexual_assault_and_other_criminal_acts.pdf.



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