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**Standard for the Analytical Scope and Sensitivity of
Forensic Toxicological Testing of Blood in Medicolegal
Death Investigations**

DRAFT



Standard for the Analytical Scope and Sensitivity of Forensic Toxicological Testing of Blood in Medicolegal Death Investigations

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Foreword

The medicolegal death investigation community relies upon quality toxicological testing to assist in determining the cause and manner of death. This document promotes standardization of the analytical scope and sensitivity of forensic toxicological testing of blood in medicolegal death investigations. These requirements were developed based on the current prevalence and availability of drugs 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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All hyperlinks and web addresses shown in this document are current as of the publication date of this standard.

Keywords: *medicolegal death investigations; postmortem toxicology; scope of testing; analytical sensitivity; forensic toxicology*

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Standard for the Analytical Scope and Sensitivity of Forensic Toxicological Testing of Blood in Medicolegal Death Investigations

1 Scope

This document delineates the minimum requirements for target analytes and analytical sensitivity for the forensic toxicological testing of blood specimens collected in medicolegal death investigations. This document does not cover the analysis of urine, tissues, or other specimens that are commonly analyzed in medicolegal death investigations.

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

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.

3.5

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 Background

4.1 Postmortem forensic toxicology encompasses many different types of cases. However, the primary role of the postmortem forensic toxicology laboratory is to provide information for the determination of whether drugs or chemicals contributed to the cause and/or manner of death.

4.2 Postmortem toxicology can be divided into the following two general categories.

4.2.1 Suspected Toxicological Cause of Death Determination. Inclusion or exclusion of drugs or chemicals in cause of death certifications.

4.2.2 Known Anatomical Cause of Death. To determine the contributing role or impact of drugs or chemicals for cases with a known anatomical cause of death.

4.3 It may be necessary to modify the analytical scope and sensitivity of testing when unique circumstances (e.g., limited sample volume or mass casualties) affect a particular case.

5 Requirements for Forensic Toxicological Testing of Blood Specimens in Medicolegal Death Investigations

5.1 General Requirements

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

5.1.2 Laboratories should consider including other potentially toxic substances based on regional drug trends and case histories.

5.2 Suspected Toxicological Cause of Death Determination

Toxicological analyses in support of cause of death investigations shall include, at a minimum, the testing for analytes listed in Table 1 at or below the analytical sensitivity designated for each analyte.

5.3 Known Anatomical Cause of Death

Toxicological analyses in support of death investigations for cases with a known anatomical cause of death, shall include, at a minimum, the testing for analytes listed in Table 2 at or below the analytical sensitivity designated for each analyte.

5.4 Directed Analysis

Under unique circumstances, limited analyte-specific testing may be performed based on case circumstances or as directed by the customer. If the testing is for analytes contained within Table 1, the designated analytical sensitivity shall be met.

Table 1 – Required Minimum Analytical Scope and Sensitivity for Testing of Blood in Suspected Toxicological Cause of Death Determination¹

Compound	Blood Screen	Blood Confirm
Volatiles (g/dL)		
Acetone	0.01	0.01
Isopropanol		
Ethanol	0.02	0.02
Methanol		
Anticonvulsants (ng/mL)		
10-OH-carbazepine	1000	1000
Carbamazepine		
Gabapentin		
Lamotrigine		
Levetiracetam		
Pregabalin		
Phenytoin		
Primidone		
Topiramate		
Antidepressants (ng/mL)		
Amitriptyline	200	200
Bupropion		
Citalopram		
Clomipramine		
Desipramine		
Doxepin		
Duloxetine		
Fluoxetine		
Imipramine		
Mirtazapine		
Nortriptyline		
O-desmethylvenlafaxine		
Paroxetine		
Sertraline		
Trazodone		
Venlafaxine		
Antihistamines/Antitussives (ng/mL)		
Chlorpheniramine	100	100
Diphenhydramine		
Doxylamine		
Hydroxyzine		
Methorphan		
Promethazine		
Antipsychotics (ng/mL)		
9-hydroxyrisperidone	50	50
Risperidone		
Chlorpromazine	200	200
Clozapine		
Olanzapine		
Quetiapine		
Barbiturates (ng/mL)		
Butalbital	1000	1000
Pentobarbital		
Phenobarbital		
Secobarbital		
Benzodiazepines/Sedatives (ng/mL)		
7-aminoclonazepam	15	15
Alprazolam		
Clonazepam		
Lorazepam		
Zolpidem		
Diazepam	50	50
Nordiazepam		
Oxazepam		
Temazepam		
Cannabinoids (ng/mL)		
THC	N/A	2
THC-COOH	10	10
Carbon Monoxide²		
COHb	10%	10%
Dissociatives (ng/mL)		
Ketamine	20	20
Phencyclidine		
Cocaine (ng/mL)		
Cocaine	N/A	20
Cocaethylene		
Benzoylcegonine	50	50
Muscle Relaxants (ng/mL)		
Cyclobenzaprine	50	50
Carisoprodol	1000	1000
Meprobamate		
Opioids (ng/mL)		
Buprenorphine	1	1
Fentanyl		
6-acetylmorphine	N/A	5
Oxymorphone	5	5
Codeine	10	10
Hydrocodone		
Hydromorphone		
Morphine		
Oxycodone		
Methadone		
Tramadol		
Over the Counter Pain Medications (µg/mL)³		
Acetaminophen	10	10
Salicylates	50	50
Sympathomimetic Amines (ng/mL)		
Amphetamine	25	25
Methamphetamine		
Methylenedioxymphetamine (MDA)		
Methylenedioxymphetamine (MDMA)		

¹ If a compound does not need to be accounted for in the screen, it is indicated by "N/A"; ² Suspected carbon monoxide-related cases only; ³ Required if requested or necessary due to case circumstances.

Table 2 – Required Minimum Analytical Scope and Sensitivity for Testing of Blood in Cases with a Known Anatomical Cause of Death

Compound	Blood Screen	Blood Confirmation
Volatiles (g/dL)		
Ethanol	0.02	0.02
Benzodiazepines/Sedatives (ng/mL)		
7-aminoclonazepam Alprazolam Clonazepam Lorazepam	15	15
Diazepam Nordiazepam Oxazepam Temazepam	50	50
Cannabinoids (ng/mL)		
THC-COOH	10	10
Cocaine (ng/mL)		
Benzoylcegonine	50	50
Opioids (ng/mL)		
Fentanyl	1	1
Codeine Hydrocodone Morphine Oxycodone	10	10
Sympathomimetic Amines (ng/mL)		
Amphetamine Methamphetamine	25	25

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] Baselt, Randall C. *Disposition of Toxic Drugs and Chemicals in Man*. 11th Edition, 2017. Biomedical Publications, Seal Beach, CA.
- 2] Druid, Henrik and Holmgren, Per. A Compilation of Fatal and Control Concentrations of Drugs in Postmortem Femoral Blood. *Journal of Forensic Sciences*, Vol. 42(1), 1997, pp. 79-87.
- 3] Launiainen, Terhi and Ojanperä, Ilkka. Drug Concentrations in Post-Mortem Femoral Blood Compared with Therapeutic Concentrations in Plasma. *Drug Testing and Analysis*, Vol. 6(4), 2014, pp. 308-16.
- 4] Levine, Barry S. (Ed). *Principles of Forensic Toxicology*, 4th Edition, 2013. AACC Press, Washington, DC.
- 5] U.S. Department of Justice, Drug Enforcement Administration. *National Forensic Laboratory Information System (NFLIS) - Drug 2018 Annual Report*.
<https://www.nflis.deadiversion.usdoj.gov/DesktopModules/ReportDownloads/Reports/NFLIS-Drug-AR2018.pdf>. Accessed 13 May 2020.



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