
Overview**Useful For**

Determination of heroin use

Method Name

Gas Chromatography-Mass Spectrometry (GC-MS)

NY State Available

Yes

Specimen**Specimen Type**

Urine

Ordering Guidance

1. For situations where chain of custody is required, a Chain-of-Custody Kit (T282) is available. For chain-of-custody testing, order 6MAMX / 6-Monoacetylmorphine, Chain of Custody, Random, Urine.
2. If urine creatinine is required or adulteration of the sample is suspected, order ADULT / Adulterants Survey, Random, Urine.
3. Additional drug panels and specific requests are available. Call 800-533-1710 or 507-266-5700.

Specimen Required

Supplies: Urine Tubes, 10 mL (T068)

Container Tube: Plastic, 10-mL urine tube

Specimen Volume: 10 mL

Collection Instructions:

1. Collect a random urine specimen.
2. No preservative.

Additional Information:

1. No specimen substitutions.
2. STATS are **not** accepted for this test.

Forms

If not ordering electronically, complete, print, and send a [Therapeutics Test Request](#) (T831) with the specimen.

Reject Due To

Gross hemolysis OK
Gross icterus OK

Specimen Minimum Volume

2.1 mL

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Urine	Refrigerated (preferred)	14 days	
	Frozen	14 days	
	Ambient		

Clinical & Interpretive**Clinical Information**

Heroin (diacetylmorphine) is a semisynthetic opiate that is closely related to morphine. It is no longer used clinically in the United States, though elsewhere it is used for rapid relief of pain.(1) Like morphine and other opiates, its relaxing and euphoric qualities make heroin a popular drug of abuse. Heroin is commonly injected intravenously, although it can be administered by other means such as snorting, smoking, or inhaling vapors.

Heroin shares the core structure of morphine, with the addition of 2 acetyl groups, which are thought to enhance its permeation into the central nervous system.(2,3) Heroin is metabolized by sequential removal of these acetyl groups; loss of first acetyl group converts heroin into 6-monoacetylmorphine (6-MAM) and loss of the second acetyl group converts 6-MAM to morphine, the dominant metabolite of heroin.(2,3) Heroin is rarely found intact in urine, since only 0.1% of a dose is excreted unchanged. 6-MAM is a unique metabolite of heroin, and its presence is a definitive indication of recent heroin use. Like heroin, 6-MAM has a very short half-life and detection window.

Reference Values

Negative

Cutoff concentrations:

6-MAM

<5 ng/mL

Interpretation

The presence of 6-monoacetylmorphine (6-MAM) in urine is definitive for recent heroin use. However, the absence of 6-MAM does not rule-out heroin use because of its short half-life. 6-MAM is typically only detectable within 24 hours of heroin use. 6-MAM is further metabolized into morphine, which may be detected 1 to 2 days after 6-MAM is no longer measurable. Morphine will typically be found in a specimen containing 6-MAM.(2,3)

Cautions

While 6-monoacetylmorphine (6-MAM) is metabolized to morphine, the presence of morphine alone is not sufficient evidence to prove heroin use. 6-MAM is the only definitive metabolite of heroin.

Clinical Reference

1. Giovannelli M, Bedford N, Aitkenhead A: Survey of intrathecal opioid usage in the UK. *Eur J Anaesthesiol* 2008;25:118-1122
2. Principles of Forensic Toxicology. Second edition. Washington DC. AACC Press, 2003, pp 187-205
3. Hardman JG, Limbird LE, Gilman AG: Goodman and Gilman's. The Pharmacological Basis of Therapeutics. 10th edition McGraw-Hill Book Company, 2001 pp 590-592
4. Principles of Forensic Toxicology. Fourth edition. AACC Press, 2013
5. Langman LJ, Bechtel LK, Meier BM, Holstege C: Chapter 41: Clinical Toxicology. In Tietz Textbook of Clinical Chemistry and Molecular Diagnostics. Edited by N Rifai, AR Horvath, CT Wittwer. Sixth edition. Elsevier, 2018 p 872

Performance

Method Description

6-Monoacetylmorphine is extracted using solid phase extraction techniques. The eluent is evaporated, reconstituted in organic solvent, and then derivatized. It is then analyzed by gas chromatography-mass spectrometry using selected ion monitoring.(Unpublished Mayo method)

PDF Report

No

Specimen Retention Time

2 weeks

Performing Laboratory Location

Rochester

Fees & Codes**Test Classification**

This test was developed, and its performance characteristics determined by Mayo Clinic in a manner consistent with CLIA requirements. This test has not been cleared or approved by the US Food and Drug Administration.

CPT Code Information

80356

G0480 (if appropriate)

LOINC® Information

Test ID	Test Order Name	Order LOINC Value
6MAMU	6-MAM Confirmation, U	19593-3

Result ID	Reporting Name	LOINC®
30983	6-Monoacetylmorphine by GC/MS	19593-3
29898	6-MAM Interpretation	69050-3
29899	Chain of Custody	77202-0