MAYO CLINIC LABORATORIES

Test Definition: PMHPU

Pain Management Hybrid Profile, 22 Drug Classes, High-Resolution Mass Spectrometry and Immunoassay Screen, Random, Urine

Overview

Useful For

Detecting drug use involving stimulants, barbiturate, benzodiazepines, cocaine, opioids, tetrahydrocannabinol, gabapentinoids, and alcohol.

Clinical monitoring or management of patients

This test is **not intended** for use in employment-related testing.

Profile Information

Test Id	Reporting Name	Available Separately	Always Performed
LPCM	List Patient's Current Medications	No	Yes
ADULT	Adulterants Survey, U	Yes	Yes
LDPU	Limited Drug Panel, 3, IA, U	No	Yes
TOPU	Targeted Opioid MS Screen, U	Yes, (Order TOSU)	Yes
TABSU	Targeted Benzodiazepine Screen, U	Yes, (Order TBSU)	Yes
TSIM	Gabapentinoid/Stim MS Screen, U	Yes, (Order TGSU)	Yes
ETGSR	Ethyl Glucuronide Scrn w/Reflex, U	No	Yes

Reflex Tests

Test Id	Reporting Name	Available Separately	Always Performed
ETGC	Ethyl Glucuronide Confirmation, U	Yes	No

Testing Algorithm

Testing begins with an adulterant survey. If the sample is found to be adulterated, testing will end and the remaining tests will be canceled.

If the specimen is normal or only diluted, remaining testing will continue.

Positive results can be confirmed and quantitated by definitive methods: gas chromatography mass spectrometry for barbiturates, cocaine and metabolites and liquid chromatography tandem mass spectrometry for tetrahydrocannabinol

metabolites. Ethyl glucuronide/ethyl sulfate confirmation will be performed at an additional charge.

Special Instructions

- Clinical Toxicology CPT Code Client Guidance

Method Name

ADULT: Spectrophotometry (SP)
ETGSR, LDPU: Immunoassay
TABSU, TOPU, TSIM: Liquid Chromatography Tandem Mass Spectrometry, High-Resolution Accurate Mass (LC-MS/MS HRAM)

NY State Available

Yes

Specimen

Specimen Type

Urine

Ordering Guidance

This test **does not** screen for drug classes other than those listed in Reference Values.

Specimen Required

Supplies: Urine Container, 60 mL (T313)
Collection Container/Tube: Plastic urine container
Submission Container/Tube: Plastic, 60-mL urine container
Specimen Volume: 30 mL
Collection Instructions:
1. Collect a random urine specimen.
2. Submit 30 mL in 1 plastic bottle.
3. No preservative.
Additional Information:
1. No specimen substitutions.
2. Submitting less than 30 mL may compromise the ability to perform all necessary testing.
3. STAT requests are **not accepted** for this test.

Specimen Minimum Volume

20 mL

Reject Due To

All specimens will be evaluated at Mayo Clinic Laboratories for test suitability.

Specimen Stability Information

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

Clinical & Interpretive

Clinical Information

The limited drug profile uses screening techniques that involves immunoassay testing and was designed to test for barbiturates, cocaine, and carboxy- tetrahydrocannabinol. All positive immunoassay screening results can be confirmed by gas chromatography mass spectrometry or liquid chromatography tandem mass spectrometry (LC-MS/MS) and quantitated if applicable.

Ethyl glucuronide is tested by immunoassay and confirmed by LC-MS/MS

The targeted opioid, benzodiazepine, and stimulant screen portions are performed using liquid chromatography tandem mass spectrometry, high-resolution accurate mass (HRAM) and are completed for all opioids, benzodiazepines, and stimulants. Opioids are a large class of medications commonly used to relieve acute and chronic pain or help manage opioid abuse and dependence. Medications that fall into this class include buprenorphine, codeine, fentanyl, hydrocodone, hydromorphone, methadone, morphine, oxycodone, oxymorphone, tapentadol, tramadol, and others. Opioids work by binding to the opioid receptors that are found in the brain, spinal cord, gastrointestinal tract, and other organs. Common side effects for opioids include drowsiness, confusion, nausea, constipation, and, in severe cases, respiratory depression. These are dose-dependent and vary with tolerance. These medications can also produce physical and psychological dependence and have a high risk for abuse and diversion, which is one of the main reasons many professional practice guidelines recommend compliance testing in patients prescribed these medications.

Opioids are readily absorbed from the gastrointestinal tract, nasal mucosa, lungs, and after subcutaneous or intermuscular injection. Opioids are primarily excreted from the kidney in both free and conjugated forms. This assay does not hydrolyze the urine sample and looks for both parent drugs and metabolites (including glucuronide forms). The detection window for most opioids in urine is approximately 1 to 3 days with longer detection times for some compounds (ie, methadone).

Benzodiazepines represent a large family of medications used to treat a wide range of disorders from anxiety to seizures and are also used in pain management. With a high risk for abuse and diversion, professional practice guidelines recommend compliance monitoring for these medications using urine drug tests. However, traditional benzodiazepine immunoassays suffer from a lack of cross-reactivity with all the benzodiazepines, so many compliant patients taking either clonazepam (Klonopin) or lorazepam (Ativan) may screen negative by immunoassay but are positive when confirmatory testing is done. The new targeted benzodiazepine screening test provides a more sensitive and specific test to check for compliance to all the commonly prescribed benzodiazepines and looks for both parent drugs and

metabolites in the urine.

Stimulants are sympathomimetic amines that stimulate the central nervous system activity and, in part, suppress the appetite. Amphetamine and methamphetamine are also prescription drugs used in the treatment of narcolepsy and attention-deficit disorder/attention-deficit hyperactivity disorder (ADHD). Methylphenidate is another stimulant used to treat ADHD. Phentermine is indicated for the management of obesity. All other amphetamines (eg, methylenedioxymethamphetamine: MDMA) are Drug Enforcement Administration-scheduled Class I compounds. Due to their stimulant effects, the drugs are commonly sold illicitly and abused. Physiological symptoms associated with very high amounts of ingested amphetamine or methamphetamine include elevated blood pressure, dilated pupils, hyperthermia, convulsions, and acute amphetamine psychosis.

Gabapentinoids (pregabalin, gabapentin) are widely used in neurology, psychiatry, and primary care, with increasing reports of misuse. They decrease central neuronal excitability by binding to the calcium channel of hyperexcited neurons which results in a reduction in the release of excitatory molecules including glutamate and noradrenaline. Gabapentin is not metabolized or protein bound and is primarily excreted and detectable in the urine for up to four days. Pregabalin is also largely excreted unchanged in the urine and detectable for up to 6 days.

Ethyl glucuronide is a direct metabolite of ethanol that is formed by enzymatic conjugation of ethanol with glucuronic acid. Alcohol in urine is normally detected for only a few hours, whereas ethyl glucuronide can be detected in the urine for 1 to 5 days. This procedure uses immunoassay reagents that are designed to produce a negative result when no drugs are present in a natural (eg, unadulterated) specimen of urine; the assay is designed to have a high true-negative rate. Like all immunoassays, it can have a false-positive rate due to cross-reactivity with natural chemicals and drugs other than those they were designed to detect. The immunoassay also has a false-negative rate to the antibody's ability to cross-react with different drugs in the class being screened.

This test is intended to be used in a setting where the test results can be used to make a definitive diagnosis.

Reference Values

ADULTERANT SURVEY:
Cutoff concentrations
Oxidants: 200 mg/L
Nitrites: 500 mg/L

LIMITED DRUG PROFILE, 3 DRUG CLASSES, IMMUNOASSAY PANEL:
Negative
Screening cutoff concentrations:
Barbiturates: 200 ng/mL
Cocaine (benzoylecgonine-cocaine metabolite): 150 ng/mL
Tetrahydrocannabinol carboxylic acid: 50 ng/mL

TARGETED OPIOID MASS SPECTROMETRY SCREEN:
Not detected (Positive results are reported with qualitative "Present" results)

Cutoff concentrations:
Codeine: 25 ng/mL
Codeine-6-beta-glucuronide: 100 ng/mL
Morphine: 25 ng/mL
Morphine-6-beta-glucuronide: 100 ng/mL
6-Monoacetylmorphine: 25 ng/mL
Hydrocodone: 25 ng/mL
Norhydrocodone: 25 ng/mL
Dihydrocodeine: 25 ng/mL
Hydromorphone: 25 ng/mL
Hydromorphone-3-beta-glucuronide: 100 ng/mL
Oxycodone: 25 ng/mL
Noroxycodone: 25 ng/mL
Oxymorphone: 25 ng/mL
Oxymorphone-3-beta-glucuronide: 100 ng/mL
Noroxymorphone: 25 ng/mL
Fentanyl: 2 ng/mL
Norfentanyl: 2 ng/mL
Meperidine: 25 ng/mL
Normeperidine: 25 ng/mL
Naloxone: 25 ng/mL
Naloxone-3-beta-glucuronide: 100 ng/mL
Methadone: 25 ng/mL
2-Ethylidene-1,5-dimethyl-3,3-diphenylpyrrolidine (EDDP): 25 ng/mL
Tramadol: 25 ng/mL
O-desmethyltramadol: 25 ng/mL
Tapentadol: 25 ng/mL
N-desmethyltapentadol: 50 ng/mL
Tapentadol-beta-glucuronide: 100 ng/mL
Buprenorphine: 5 ng/mL
Norbuprenorphine: 5 ng/mL
Norbuprenorphine glucuronide: 20 ng/mL

TARGETED BENZODIAZEPINE MASS SPECTROMETRY SCREEN:
Not detected (Positive results are reported with qualitative "Present" results)

Cutoff concentrations:
Alprazolam: 10 ng/mL
Alpha-hydroxyalprazolam: 10 ng/mL
Alpha-hydroxyalprazolam glucuronide: 50 ng/mL
Chlordiazepoxide: 10 ng/mL
Clobazam: 10 ng/mL
N-desmethylclobazam: 200 ng/mL

Clonazepam: 10 ng/mL
7-Aminoclonazepam: 10 ng/mL
Diazepam: 10 ng/mL
Nordiazepam: 10 ng/mL
Flunitrazepam: 10 ng/mL
7-Aminoflunitrazepam: 10 ng/mL
Flurazepam: 10 ng/mL
2-Hydroxy ethyl flurazepam: 10 ng/mL
Lorazepam: 10 ng/mL
Lorazepam glucuronide: 50 ng/mL
Midazolam: 10 ng/mL
Alpha-hydroxymidazolam: 10 ng/mL
Oxazepam: 10 ng/mL
Oxazepam glucuronide: 50 ng/mL
Prazepam: 10 ng/mL
Temazepam: 10 ng/mL
Temazepam glucuronide: 50 ng/mL
Triazolam: 10 ng/mL
Alpha-hydroxytriazolam: 10 ng/mL
Zolpidem: 10 ng/mL
Zolpidem phenyl-4-carboxylic acid: 10 ng/mL

TARGETED GABAPENTINOID AND STIMULANT MASS SPECTROMETRY SCREEN:
Not detected (Positive results are reported with qualitative "Present" results)

Cutoff concentrations:
Methamphetamine: 100 ng/mL
Amphetamine: 100 ng/mL
3,4-Methylenedioxymethamphetamine (MDMA): 100 ng/mL
3,4-Methylenedioxy-N-ethylamphetamine (MDEA): 100 ng/mL
3,4-Methylenedioxyamphetamine (MDA): 100 ng/mL
Ephedrine: 100 ng/mL
Pseudoephedrine: 100 ng/mL
Phentermine: 100 ng/mL
Phencyclidine (PCP): 20 ng/mL
Methylphenidate: 20 ng/mL
Ritalinic acid: 100 ng/mL
Gabapentin: 500 ng/mL
Pregabalin: 500 ng/mL

ETHYL GLUCURONIDE SCREEN:
Negative
Screening cutoff concentrations:

Ethyl glucuronide: 500 ng/mL

Interpretation

A positive result derived by this testing indicates that the patient has used one of the drugs detected by these techniques in the recent past.

For information about drug testing, including estimated detection times and Result Interpretations, see Controlled Substance Monitoring on MayoClinicLabs.com.

Cautions

Care should be taken when interpreting ethyl glucuronide test results since many factors (eg, fluid intake and other biologic factors) may influence a urine test result. It is possible that substances other than those investigated in the specificity study may interfere with the test and cause false-positive or false-negative results.

Clinical Reference

1. Physicians' Desk Reference; 60th ed. Medical Economics Company; 2006
2. Bruntman LL, ed. Goodman and Gilman's: The Pharmacological Basis of Therapeutics. 11th ed. McGraw-Hill Book Company; 2006
3. Langman LJ, Bechtel LK, Holstege CP. Clinical toxicology. In: Rifai N, Chiu RWK, Young I, Burnham CAD, Wittwer CT, eds. Tietz Textbook of Laboratory Medicine. 7th ed. Elsevier; 2023:chap 43
4. Gutstein HB, Akil H. Opioid analgesics. In: Brunton LL, Lazo JS, Parker KL, eds. Goodman and Gilman's: The Pharmacological Basis of Therapeutics. 11th ed. McGraw-Hill Companies; 2006
5. Rovine T, Ferrero CL, American Pain Society: Chronic Pain in America: Roadblocks to Relief. Roper Starch Worldwide, Inc; 1999. Updated October 2, 2001. Accessed September 8, 2026. Available at http://accurateclinic.com/wp-content/uploads/2016/04/Chronic-Pain-In-America-Roadblocks-To-Relief-1999.pdf
6. Magnani B, Kwong T. Urine drug testing for pain management. Clin Lab Med. 2012;32(3):379-390
7. Jannetto PJ, Bratanow NC, Clark WA, et al. Executive summary: American Association of Clinical Chemistry Laboratory Medicine Practice Guideline-using clinical laboratory tests to monitor drug therapy in pain management patients. J Appl Lab Med. 2018;2(4):489-526
8. McMillin GA, Marin SJ, Johnson-Davis KL, Lawlor BG, Strathmann FG. A hybrid approach to urine drug testing using high-resolution mass spectrometry and select immunoassays. Am J Clin Pathol. 2015;143(2):234-240
9. Cone EJ, Caplan YH, Black DL, Robert T, Moser F. Urine drug testing of chronic pain patients: licit and illicit drug patterns. J Anal Toxicol. 2008;32(8):530-543

Performance

Method Description

Adulterant:
All results are measured using spectrophotometry at wavelengths specified by the reagent manufacturer. The use of a refractometer may also be used in the specific gravity measurement.(Package inserts: Specimen Validity Test Creatinine. Roche Diagnostics; V3.0, 05/2023; Specimen Validity Test Nitrite. Roche Diagnostics; V2.0, 05/2022, Specimen Validity

Test Oxidant. Roche Diagnostics; V2.0, 05/2022; Specimen Validity Test pH Roche Diagnostics; V2.0, 05/2022, Specimen Validity Test Specific Gravity. Roche Diagnostics; V3.0, 08/2022)

Limited drug profile immunoassay panel:
The barbiturate, cocaine metabolite, and tetrahydrocannabinol metabolite assays are based on the kinetic interaction of microparticles in a solution as measured by changes in light transmission. In the absence of sample drug, soluble drug conjugates bind to antibody-bound microparticles, causing the formation of particle aggregates. As the aggregation reaction proceeds in the absence of sample drug, the absorbance increases. When a urine sample contains the drug in question, this drug competes with the drug derivative conjugate for microparticle-bound antibody. Antibody bound to sample drug is no longer available to promote particle aggregation, and subsequent particle lattice formation is inhibited. The presence of sample drug diminishes the increasing absorbance in proportion to the concentration of drug in the sample. Sample drug content is determined relative to the value obtained for a known cutoff concentration of drug.(Package inserts: BARB. Roche Diagnostics; V3.0, 04/2024; THC2. Roche Diagnostics; V4.0, 06/2024; COC2. Roche Diagnostics; V4.0, 04/2024)

Opioid, benzodiazepine, and gabapentinoid/stimulant targeted screening panels:
The urine sample is diluted with internal standard and clinical laboratory reagent water and then analyzed by liquid chromatography tandem mass spectrometry using a high-resolution accurate mass orbitrap detector.(Unpublished Mayo method)

Ethyl glucuronide screen:
This assay is a homogeneous enzyme-linked immunosorbent assay technique. The assay will be performed semiquantitatively. The assay is based on competition between free drug in the urine sample and a drug labeled with the enzyme glucose-6-phosphate dehydrogenase for a fixed amount of specific antibody binding sites. Active enzyme converts nicotinamide adenine dinucleotide (NAD[+]) to NADH, which results in an absorbance change that can be measured spectrophotometrically at 340 nm.(Package insert: ETG. Immunalysis; 03/2019)

PDF Report
No

Day(s) Performed
Monday through Saturday

Report Available
3 to 4 days

Specimen Retention Time
14 days

Performing Laboratory Location
Mayo Clinic Laboratories - Rochester Superior Drive

Fees & Codes

Fees

- Authorized users can sign in to Test Prices for detailed fee information.
- Clients without access to Test Prices can contact Customer Service 24 hours a day, seven days a week.
- Prospective clients should contact their account representative. For assistance, contact Customer Service.

Test Classification

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

CPT Code Information

G0482
80307
80364 (if appropriate for select payers)
80347 (if appropriate for select payers)
80326 (if appropriate for select payers)
80321 (if appropriate for select payers)
Clinical Toxicology CPT Code Client Guidance

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
PMHPU	Pain Mgt Profile, 22, HRMS/IA, U	69739-1

Result ID	Test Result Name	Result LOINC® Value
20606	Creatinine, U	2161-8
22312	Specific Gravity	5810-7
23509	pH	2756-5
23511	Oxidants	58714-7
23510	Nitrites	32710-6
30914	Comment	48767-8
604871	Alprazolam	94116-1
604867	Alpha-Hydroxyalprazolam	19325-0
604891	Alpha-Hydroxyalprazolam Glucuronide	94115-3
604872	Chlordiazepoxide	19385-4
604889	Clobazam	94114-6
604890	N-Desmethylclobazam	94113-8
604873	Clonazepam	19399-5
604267	7-aminoclonazepam	94112-0

604874	Diazepam	19443-1
604880	Nordiazepam	19624-6
604875	Flunitrazepam	19466-2
604866	7-aminoflunitrazepam	94111-2
604876	Flurazepam	19474-6
604868	2-Hydroxy Ethyl Flurazepam	94110-4
604877	Lorazepam	19520-6
604878	Lorazepam Glucuronide	94109-6
604879	Midazolam	19585-9
604869	Alpha-Hydroxy Midazolam	94108-8
604881	Oxazepam	19638-6
604882	Oxazepam Glucuronide	94107-0
604883	Prazepam	19678-2
604884	Temazepam	19698-0
604885	Temazepam Glucuronide	94106-2
604886	Triazolam	19714-5
604870	Alpha-Hydroxy Triazolam	94105-4
604887	Zolpidem	94104-7
604888	Zolpidem Phenyl-4-Carboxylic acid	94103-9
604949	Benzodiazepine Interpretation	69050-3
LPCM	List Patient's Current Medications	66423-5
615289	Barbiturates	19270-8
615290	Cocaine	19359-9
615291	Tetrahydrocannabinol	19415-9
616033	Ethyl Glucuronide Screen, U	58375-7
624198	Methamphetamine	19554-5
624199	Amphetamine	19343-3
624200	3,4-methylenedioxymethamphetamine (MDMA)	19568-5
624201	3,4-methylenedioxy-N-ethylamphetamine (MDEA)	59844-1
624202	3,4-methylenedioxyamphetamine (MDA)	19565-1
624203	Ephedrine	99108-3
624204	Pseudoephedrine	99109-1
624205	Phentermine	19674-1
624206	Phencyclidine (PCP)	19659-2
624207	Methylphenidate	19577-6
624208	Ritalinic acid	99110-9
624209	Gabapentin	68439-9
624210	Pregabalin	105953-4

624211	Stimulant Interpretation	54247-2
624213	Codeine	19411-8
624214	Codeine-6-beta-glucuronide	89310-7
624215	Morphine	19597-4
624216	Morphine-6-beta-glucuronide	89308-1
624217	6-monoacetylmorphine	19321-9
624218	Hydrocodone	19482-9
624219	Norhydrocodone	89304-0
624220	Dihydrocodeine	19446-4
624221	Hydromorphone	19486-0
624222	Hydromorphone-3-beta-glucuronide	89309-9
624223	Oxycodone	19642-8
624224	Noroxycodone	89303-2
624225	Oxymorphone	19646-9
624226	Oxymorphone-3-beta-glucuronide	89301-6
624227	Noroxymorphone	89302-4
624228	Fentanyl	59673-4
624229	Norfentanyl	43199-9
624230	Meperidine	19532-1
624231	Normeperidine	27920-8
624232	Naloxone	42618-9
624233	Naloxone-3-beta-glucuronide	89307-3
624234	Methadone	19550-3
624235	EDDP	93495-0
624236	Tramadol	19710-3
624237	O-desmethyltramadol	86453-8
624238	Tapentadol	72485-6
624239	N-desmethyltapentadol	89306-5
624240	Tapentadol-beta-glucuronide	89300-8
624241	Buprenorphine	93494-3
624242	Norbuprenorphine	82371-6
624243	Norbuprenorphine glucuronide	89305-7
624244	Opioid Interpretation	69050-3