MAYO CLINIC LABORATORIES

Test Definition: OPATX

Opiates Confirmation, Chain of Custody, Random, Urine

Overview

Useful For

Detection and quantification of codeine, hydrocodone, oxycodone, morphine, hydromorphone, oxymorphone, noroxycodone, noroxymorphone, norhydrocodone, dihydrocodeine, and naloxone in urine

Chain of custody is required whenever the results of testing could be used in a court of law. Its purpose is to protect the rights of the individual contributing the specimen by demonstrating that it was always under the control of personnel involved with testing the specimen; this control implies that the opportunity for specimen tampering would be limited.

Additional Tests

Test Id	Reporting Name	Available Separately	Always Performed
COCH	Chain of Custody Processing	No	Yes
ADLTX	Adulterants Survey, CoC, U	Yes	Yes

Testing Algorithm

Adulterants testing will be performed on all chain of custody urine samples as per regulatory requirements.

Method Name

Immunoassay/ Liquid Chromatography Tandem Mass Spectrometry (LC-MS/MS)

NY State Available

Yes

Specimen

Specimen Type

Urine

Ordering Guidance

This test is for situations that require the chain-of-custody process. For testing **not** requiring chain of custody, order OPATU / Opiates Confirmation, Random, Urine

Specimen Required

Supplies: Chain of Custody Kit (T282)
Container/Tube: Chain of custody kit containing the specimen containers, seals, and documentation is required.
Specimen Volume: 5 mL
Collection Instructions: Collect urine specimen in the container provided, seal, and submit with the associated

documentation to satisfy the legal requirements for chain-of-custody testing.
Additional Information: Submitting less than 5 mL will compromise our ability to perform all necessary testing.

Forms

1. Chain of Custody Request is included in the Chain-of-Custody Kit (T282).
2. If not ordering electronically, complete, print, and send a Therapeutics Test Request (T831) with the specimen.

Specimen Minimum Volume

2.5 mL

Reject Due To

Gross hemolysis	OK
Gross icterus	OK

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Urine	Refrigerated (preferred)	28 days	
	Ambient	14 days	
	Frozen	28 days	

Clinical & Interpretive

Clinical Information

Codeine is converted by hepatic metabolism to morphine and norcodeine with a half-life of 2 to 4 hours. If codeine is ingested, the ratio of codeine to morphine generally exceeds 1.0 in urine during the first 24 hours. The ratio may fall below 1.0 after 24 hours; and after 30 hours, only morphine may be detected.

Morphine is a naturally occurring narcotic analgesic obtained from the poppy plant, *Papaver somniferum*. Morphine is converted by hepatic metabolism to normorphine with a half-life of 2 to 4 hours. The presence of morphine in urine can indicate exposure to morphine, heroin, or codeine within 2 to 3 days. Ingestion of bakery products containing poppy seeds can also cause morphine to be excreted in urine. If excessively large amounts are consumed, this can result in urine morphine concentrations up to 2000 ng/mL for a period of 6 to 12 hours after ingestion.

Hydrocodone exhibits a complex pattern of metabolism including O-demethylation, N-demethylation, and 6-keto reduction to the 6-beta hydroxymetabolites. Hydromorphone and norhydrocodone are both metabolites of hydrocodone. Dihydrocodeine is also a minor metabolite. Trace amounts of hydrocodone can also be found in the presence of approximately 100-fold higher concentrations of oxycodone or hydromorphone since it can be a pharmaceutical impurity in these medications. The presence of hydrocodone indicates exposure within 2 to 3 days prior to specimen collection.

Hydromorphone is metabolized primarily in the liver and is excreted primarily as the glucuronidated conjugate, with small amounts of parent drug and minor amounts of 6-hydroxy reduction metabolites. The presence of hydromorphone indicates exposure within 2 to 3 days prior to specimen collection. Hydromorphone is also a metabolite of hydrocodone; therefore, the presence of hydromorphone could also indicate exposure to hydrocodone.

Dihydrocodeine is a semisynthetic narcotic analgesic prepared by the hydrogenation of codeine. It is also a minor metabolite of hydrocodone. It is metabolized to dihydromorphine and has a half-life of 3.4 to 4.5 hours.

Oxycodone is metabolized to noroxycodone, oxymorphone, and their glucuronides and is excreted primarily via the kidney. The presence of oxycodone indicates exposure to oxycodone within 2 to 3 days prior to specimen collection.

Oxymorphone is metabolized in the liver to noroxymorphone and excreted via the kidney primarily as the glucuronide conjugates. Oxymorphone is also a metabolite of oxycodone and, therefore, the presence of oxymorphone could also indicate exposure to oxycodone.

Naloxone is a synthetic narcotic antagonist and used for partial or complete reversal of opioid depression induced by natural or synthetic opioids. It has also been incorporated into oral tablets of opioids to discourage abuse. The duration of action is dependent on the dose and route of administration. The half-life in adults is approximately 30 to 81 minutes.

The detection interval for the opiates is generally 2 to 3 days after last ingestion.

Chain of custody is a record of the disposition of a specimen to document each individual who collected, handled, and performed the analysis. When a specimen is submitted in this manner, analysis will be performed in such a way that it will withstand regular court scrutiny.

Reference Values

Negative
Positive results are reported with a quantitative result.

Cutoff concentrations:

Immunoassay screen: 300 ng/mL

Liquid chromatography tandem mass spectrometry:
Codeine: 25 ng/mL
Dihydrocodeine: 25 ng/mL
Hydrocodone: 25 ng/mL
Norhydrocodone: 25 ng/mL
Hydromorphone: 25 ng/mL
Oxycodone: 25 ng/mL
Noroxycodone: 25 ng/mL
Oxymorphone: 25 ng/mL
Noroxymorphone: 25 ng/mL
Naloxone: 25 ng/mL

Morphine: 25 ng/mL

Interpretation

This procedure reports the total urine concentration; this is the sum of the unconjugated and conjugated forms of the parent drug.

Cautions

This test detects drugs structurally similar to morphine. Other drugs in the opioid class, such as fentanyl, meperidine, and methadone are not detected.

Clinical Reference

1. Jutkiewicz EM, Traynor JR. Opioid analgesics. In: Brunton LL, Knollmann BC, eds. Goodman and Gilman's: The Pharmacological Basis of Therapeutics. 14th ed. McGraw-Hill Companies, Inc; 2023:chap 23
2. Baselt, RC. Disposition of Toxic Drugs and Chemical in Man. 10th ed. Biomedical Publications; 2014
3. Hackett LP, Dusci LJ, Ilett KF, Chiswell GM. Optimizing the hydrolysis of codeine and morphine glucuronides in urine. Ther Drug Monit. 2002;24(5):652-657
4. 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

Performance

Method Description

Opiates exist in patient urine as both free and either sulfate or glucuronide conjugates. Specimens are initially screened by immunoassay. The opiate assay is 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. The nicotinamide adenine dinucleotide hydrogen (NADH) formed during the reaction, measured photometrically as a rate of change in absorbance, is directly proportional to the ethyl alcohol concentration.(Package insert: OPI2 cobas. Roche Diagnostics; V 6.0, 07/2024)

After screening, enzyme hydrolysis is used to liberate the conjugated drug. Specimens are then centrifuged, diluted, and the analytes are separated by liquid chromatography tandem mass spectroscopy and analyzed by multiple reaction monitoring.(Unpublished Mayo method)

PDF Report

No

Day(s) Performed

Monday through Friday

Report Available
3 to 5 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
G0480
80361 (if appropriate for select payers)
80365 (if appropriate for select payers)
80362 (if appropriate for select payers)
Clinical Toxicology CPT Code Client Guidance

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
OPATX	Opiate Confirmation, CoC, U	106506-9

Result ID	Test Result Name	Result LOINC® Value
6541	Opiates Immunoassay Screen	70151-6
36213	Codeine-by LC-MS/MS	16250-3
36214	Hydrocodone-by LC-MS/MS	16252-9
36215	Hydromorphone-by LC-MS/MS	16998-7
36216	Oxycodone-by LC-MS/MS	16249-5
36212	Oxymorphone-by LC-MS/MS	17395-5
36217	Morphine-by LC-MS/MS	16251-1

36218	Opiates Interpretation	69050-3
36219	Chain of Custody	77202-0
42005	Dihydrocodeine-by LC-MS/MS	19448-0
42006	Norhydrocodone-by LC-MS/MS	61422-2
42007	Noroxycodone-by LC-MS/MS	61425-5
42008	Noroxymorphone-by LC-MS/MS	90894-7
42009	Naloxone-by LC-MS/MS	77207-9