MAYO CLINIC LABORATORIES

Test Definition: COKEM

Cocaine and Metabolites Confirmation, Meconium

Overview

Useful For
Detecting in utero drug exposure up to 5 months before birth

Method Name
Liquid Chromatography Tandem Mass Spectrometry (LC-MS/MS)

NY State Available
Yes

Specimen

Specimen Type
Meconium

Ordering Guidance
For chain-of-custody testing, order COKMX / Cocaine and Metabolite Confirmation, Chain of Custody, Meconium.

Specimen Required
Supplies: Stool container, Small (Random), 4 oz (T288)
Container/Tube: Stool container
Specimen Volume: 1 g (approximately 1 teaspoon)
Collection Instructions: Collect entire random meconium specimen.

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

Specimen Minimum Volume
0.3 g (approximately 1/4 teaspoon)

Reject Due To

Grossly bloody	Reject; Pink OK
Stool specimen	Reject
Specimen in a diaper	Reject

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Meconium	Frozen (preferred)	21 days	
	Ambient	72 hours	
	Refrigerated	21 days	

Clinical & Interpretive

Clinical Information

Cocaine is an alkaloid found in *Erythroxylon coca*, which grows principally in the northern South American Andes and, to a lesser extent, in India, Africa, and Java.(1) Cocaine is a powerfully addictive stimulant drug. Cocaine abuse has a long history, is rooted in the drug culture in the United States,(2) and is 1 of the most common illicit drugs of abuse.(3,4) Cocaine is rapidly metabolized primarily to benzoylecgonine, which is further metabolized to m-hydroxybenzoylecgonine (m-HOBE).(1,5) Cocaine is frequently used with other drugs, most commonly alcohol, and the simultaneous use of both can be determined by the presence of the unique metabolite cocaethylene.(4)

Intrauterine drug exposure to cocaine has been associated with placental abruption, premature labor, small for gestational age status, microcephaly, and congenital anomalies (eg, cardiac and genitourinary abnormalities, necrotizing enterocolitis, and central nervous system stroke or hemorrhage).(6)

The disposition of drug in meconium, the first fecal material passed by the neonate, is not well understood. The proposed mechanism is that the fetus excretes drug into bile and amniotic fluid. Drug accumulates in meconium either by direct deposition from bile or through swallowing of amniotic fluid.(7) The first evidence of meconium in the fetal intestine appears at approximately the 10th to 12th week of gestation and slowly moves into the colon by the 16th week of gestation.(8) Therefore, the presence of drugs in meconium has been proposed to be indicative of in utero drug exposure during the final 4 to 5 months of pregnancy, a longer historical measure than is possible by urinalysis.(7)

Reference Values

Negative

Positive results are reported with a quantitative liquid chromatography tandem mass spectrometry (LC-MS/MS) result.

Cutoff concentrations for LC-MS/MS testing:
Cocaine: 20 ng/g
Benzoylecgonine: 20 ng/g
Cocaethylene: 20 ng/g
m-Hydroxybenzoylecgonine: 20 ng/g

Interpretation

The presence of any of the following: cocaine, benzoylecgonine, cocaethylene, or m-hydroxybenzoylecgonine, at 20 ng/g or more, is indicative of in utero drug exposure up to 5 months before birth.

Cautions

No significant cautionary statements

Clinical Reference

1. Isenschmid DS. Cocaine. In: Levine B, ed. Principles of Forensic Toxicology. 2nd ed. AACC Press; 2003:207-228
2. US Drug Enforcement Administration: Cocaine. DEA; 2020. Accessed May 13, 2026. Available at www.dea.gov/factsheets/cocaine
3. National Institute on Drug Abuse: Cocaine DrugFacts. NIDA; 2021. Accessed May 13, 2026. Available at www.drugabuse.gov/publications/drugfacts/cocaine
4. Isenschmid DS. Cocaine-effects on human performance and behavior. Forensic Sci Rev. 2002;14(1-2):61-100
5. Kolbrich EA, Barnes AJ, Gorelick DA, Boyd SJ, Cone EJ, Huestis MA. Major and minor metabolites of cocaine in human plasma following controlled subcutaneous cocaine administration. J Anal Toxicol. 2006;30(8):501-510
6. Kwong TC, Ryan RM. Detection of intrauterine illicit drug exposure by newborn drug testing. National Academy of Clinical Biochemistry. Clin Chem. 1997;43(1):235-242
7. Ostrea EM Jr, Brady MJ, Parks PM, Asensio DC, Naluz A. Drug screening of meconium in infants of drug-dependent mothers: an alternative to urine testing. J Pediatr. 1989;115(3):474-477
8. Ahanya SN, Lakshmanan J, Morgan BL, Ross MG. Meconium passage in utero: mechanisms, consequences, and management. Obstet Gynecol Surv. 2005;60(1):45-74
9. Baselt RC. Disposition of Toxic Drugs and Chemical in Man. 12th ed. Biomedical Publications; 2020.
10. Langman LJ, Bechtel LK, Holstege CP. Clinical toxicology. In: Rifai N, Chiu RWK, Young I, Burnham C-AD, Wittwer CT, eds. Tietz Textbook of Laboratory Medicine. 7th ed. St Louis, MO: Elsevier; 2023:chap 43

Performance

Method Description

Meconium is mixed with internal standard and extracted with methanol. The methanolic extract is further processed by solid-phase extraction. The extract is analyzed by liquid chromatography tandem mass spectrometry.(Unpublished Mayo method)

PDF Report

No

Day(s) Performed

Monday through Sunday

Report Available

2 to 3 days

Specimen Retention Time

2 weeks

Performing Laboratory Location

Mayo Clinic Laboratories - Rochester Superior Drive

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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
80353 (if appropriate for select payers)
Clinical Toxicology CPT Code Client Guidance

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
COKEM	Cocaine and Metabolites, Confirm, M	69008-1

Result ID	Test Result Name	Result LOINC® Value
31859	Cocaine	69009-9
31860	Benzoylecgonine	69010-7
31861	Cocaethylene	69011-5
31862	m-Hydroxybenzoylecgonine	69012-3
31864	Interpretation	69050-3
31865	Chain of Custody	77202-0