MAYO CLINIC LABORATORIES

Test Definition: THCMX

11-nor-Delta-9-Tetrahydrocannabinol-9-Carboxylic Acid (Carboxy-THC) Confirmation, Chain of Custody, Meconium

Overview

Useful For

Detecting in utero drug exposure to marijuana (tetrahydrocannabinol) up to 5 months before birth

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 under the control of personnel involved with testing the specimen at all times; this control implies that the opportunity for specimen tampering would be limited. Since the evidence of illicit drug use during pregnancy can be cause for separating the baby from the mother, a complete chain of custody ensures that the test results are appropriate for legal proceedings.

Additional Tests

Test Id	Reporting Name	Available Separately	Always Performed
COCH	Chain of Custody Processing	No	Yes

Method Name

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

NY State Available

Yes

Specimen

Specimen Type

Meconium

Shipping Instructions

The laboratory recommends sending chain-of-custody specimens by overnight shipment.

Specimen Required

Supplies: Chain-of-Custody Meconium Kit (T653) includes the specimen containers, seals, and documentation required.
Specimen Volume: 1 g (approximately 1 teaspoon)
Collection Instructions: Collect entire random meconium specimen.
Additional Information: Specimens that arrive with a broken seal do not meet the chain of custody requirements.

Forms

1. Chain of Custody Request is included in the Chain-of-Custody Meconium Kit (T653).

2. 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; Diapers	Reject

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Meconium	Frozen (preferred)	28 days	
	Ambient	14 days	
	Refrigerated	21 days	

Clinical & Interpretive

Clinical Information

Marijuana and other psychoactive products obtained from the plant *Cannabis sativa* are the most widely used illicit drugs in the world.(1) Marijuana has unique behavioral effects that include feelings of euphoria and relaxation, altered time perception, impaired learning and memory, lack of concentration, and mood changes (eg, panic reactions and paranoia).

Cannabis sativa produces numerous compounds collectively known as cannabinoids, including delta-9-tetrahydrocannabinol (THC), which is the most prevalent and produces most of the characteristic pharmacological effects of smoked marijuana.(2) THC undergoes rapid hydroxylation by the cytochrome enzyme system to form the active metabolite 11-hydroxy-THC. Subsequent oxidation of 11-hydroxy-THC produces the inactive metabolite 11-nor-delta-9-tetrahydrocannabinol-9-carboxylic acid (THC-COOH; carboxy-THC). THC-COOH and its glucuronide conjugate have been identified as the major end-products of metabolism. THC is highly lipid soluble, resulting in its concentration and prolonged retention in fat tissue.(3)

Cannabinoids cross the placenta, but a dose-response relationship or correlation has not been established between the amount of marijuana use during pregnancy and the levels of cannabinoids found in meconium, the first fecal matter passed by the neonate.(4,5) The disposition of drug in meconium 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 amniotic fluid.(5) The first evidence of meconium in the fetal intestine appears at approximately the 10th to 12th week of gestation, and it slowly moves into the colon by the 16th week of gestation.(6) 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.(5)

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
Positives are reported with a quantitative liquid chromatography tandem mass spectrometry result.
Cutoff concentration: 5 ng/g

Interpretation

The presence of 11-nor-delta-9-tetrahydrocannabinol-9-carboxylic acid at 5 ng/g or greater is indicative of in utero drug exposure up to 5 months before birth.

Cautions

No significant cautionary statements

Clinical Reference

1. Huestis MA. Marijuana. In: Levine B, ed. Principles of Forensic Toxicology. 2nd ed. AACC Press; 2003:229-264
2. O'Brein CP. Drug addiction and drug abuse. In: Burton LL, Lazo JS, Parker KL, eds. Goodman and Gilman's The Pharmacological Basis of Therapeutics. 11th ed. McGraw-Hill; 2006
3. Baselt RC. Disposition of Toxic Drugs and Chemical in Man. 12th ed. Biomedical Publications; 2020
4. Ostrea EM Jr, Knapp DK, Tannenbaum L, et al. Estimates of illicit drug use during pregnancy by maternal interview, hair analysis, and meconium analysis. J Pediatr. 2001;138(3):344-348
5. 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
6. Ahanya SN, Lakshmanan J, Morgan BL, Ross MG. Meconium passage in utero: mechanisms, consequences, and management. Obstet Gynecol Surv. 2005;60(1):45-74
7. 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. 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 spectroscopy.(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

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
80349
G0480 (if appropriate)

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
THCMX	Carboxy-THC Confirmation, CoC, M	69007-3

Result ID	Test Result Name	Result LOINC® Value
36305	Carboxy-THC	69007-3
36306	Interpretation	69050-3
36307	Chain of Custody	77202-0