MAYO CLINIC LABORATORIES

Test Definition: THCCR

Delta 9-Carboxy-Tetrahydrocannabinol (THC-COOH) Confirmation and Creatinine Ratio, Random, Urine

Overview

Useful For

Measuring the delta-9 carboxy-tetrahydrocannabinol to creatinine ratio to detect use of tetrahydrocannabinol

Profile Information

Test Id	Reporting Name	Available Separately	Always Performed
THCCU	THC-COOH/Creatinine Ratio, U	No	Yes
CRETR	Creatinine, Random, U	No	Yes

Method Name

THCCU: Liquid Chromatography Tandem Mass Spectrometry (LC-MS/MS)
CRETR: Enzymatic Colorimetric Assay

NY State Available

Yes

Specimen

Specimen Type

Urine

Specimen Required

Supplies: Urine Tubes, 10 mL (T068)
Collection Container/Tube: Plastic urine container
Submission Container/Tube: 10-mL tube
Specimen Volume: 10 mL
Collection Instructions:
1. Collect a random urine specimen.
2. Submit 10 mL in a plastic container.
3. No preservative.
Additional Information:
1. No specimen substitutions.
2. Submitting less than 10 mL may compromise the ability to perform all necessary testing.
3. STAT requests are **not accepted** for this test.

Forms

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

Specimen Minimum Volume

6 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	
	Ambient	72 hours	

Clinical & Interpretive

Clinical Information

Delta-9-tetrahydrocannabinol (THC) is the active agent of the popularly abused/used drug, cannabis/marijuana.

Following consumption of the drug, either by inhalation or ingestion, it is metabolized to a variety of inactive chemicals, one of them being delta-9-tetrahydrocannabinol carboxylic acid (delta-9-THC-COOH).

For confirmation of abstinence, urine analysis is a useful tool. The presence of delta-9-THC-COOH is a strong indicator that a patient has used cannabis/marijuana. However, increases in urine delta-9-THC-COOH concentrations resulting from changes in urinary output may be mistakenly interpreted as new drug use rather than carryover from previous drug exposure. Individuals continue to excrete THC-COOH days after abstinence, and although concentrations generally decrease with time, the concentrations can fluctuate with levels of hydration. As a result, the division of urinary delta-9-THC-COOH concentrations by creatinine produces a metabolite/creatinine ratio that should decrease until a new episode of drug use occurs. Delta-9-THC-COOH/creatinine ratios of specimens collected over time can be compared to determine if new cannabis/marijuana use has occurred.

Reference Values

Carboxy-Tetrahydrocannabinol (THC):
Not Detected

Cutoff concentration:
Delta-9 Carboxy-tetrahydrocannabinol by liquid chromatography tandem mass spectrometry: <5.0 ng/mL

Creatinine:

> or =18 years old: 16-326 mg/dL
Reference values have not been established for patients who are younger than 18 years.

Interpretation

Delta-9 carboxy-tetrahydrocannabinol (delta-9-THC-COOH) and creatinine concentrations must be obtained for at least 2 urine specimens with a known time interval (1-7 days) between collections. Using these creatinine-normalized delta-9-THC-COOH concentrations, a ratio is calculated between the concentration of any urine specimen (U2) divided by the concentration in a previously collected urine specimen (U1). The most conservative method for reporting new cannabis/marijuana use between collections would apply a U2/U1 decision ratio equal to the maxima listed in the Table. A more realistic decision ratio with reasonable certainty would be to use the 95% below limits in the same table. U2/U1 ratios above these limits would indicate new usage between those collection time points.

Table. Adapted from Smith ML et al. for less than daily users of cannabis/marijuana.(1)

Time interval between urine collections (hours)	Maximum ratio (U2/U1)	95% Below (U2/U1)
0-23.9	6.29	1.42
24-47.9	2.27	1.01
48-71.9	1.47	0.853
72-95.9	1.63	0.595
96-119.9	0.555	0.347
120-143.9	0.197	0.146
144-167.9	0.080	0.073

Cautions

No significant cautionary statements

Clinical Reference

1. Smith ML, Barnes AJ, Huestis MA. Identifying new cannabis use with urine creatinine normalized THCCOOH concentrations and time intervals between specimen collections. J Anal Toxicol. 2009;33(4):185-9. doi:10.1093/jat/33.4.185
2. Huestis MA, Cone EJ. Differentiating new marijuana use from residual drug excretion in occasional marijuana users. J Anal Toxicol. 1998;22(6):445-54. doi:10.1093/jat/22.6.445
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. Delaney MP, Lamb EJ. Kidney disease. In: Rifai N, Horvath AR, Wittwer CT, eds: Tietz Textbook of Clinical Chemistry and Molecular Diagnostics. 6th ed. Elsevier; 2018:1256-1323
5. Meeusen J, Rule A, Voskoboev N, Baumann N, Lieske J. Performance of cystatin C- and creatinine-based estimated glomerular filtration rate equations depends on patient characteristics. Clin Chem. 2015;61(10):1265-1272. doi:10.1373/clinchem.2015.243030
6. Newman DJ, Price CP. Renal function and nitrogen metabolites. In: Burtis CA, Ashwood ER, eds. Tietz Textbook of Clinical Chemistry. 3rd ed. WB Saunders Company; 1999:1204-1270
7. Kasiske BL, Keane WF. Laboratory assessment of renal disease: clearance, urinalysis, and renal biopsy. In: Brenner BM,

ed. The Kidney. 6th ed. WB Saunders Company; 2000:1129-1170

Performance

Method Description
Delta-9 Carboxy-Tetrahydrocannabinol:
Confirmation with quantification by liquid chromatography tandem mass spectrometry.(Unpublished Mayo method)

Creatinine:
The enzymatic method is based on the determination of sarcosine from creatinine with the aid of creatininase, creatinase, and sarcosine oxidase. The liberated hydrogen peroxide is measured via a modified Trinder reaction using a colorimetric indicator. Optimization of the buffer system and the colorimetric indicator enables the creatinine concentration to be quantified both precisely and specifically.(Package insert: Creatinine plus ver 2. Roche Diagnostics; V15.0, 03/2019)

PDF Report
No

Day(s) Performed
Monday through Friday

Report Available
2 to 4 days

Specimen Retention Time
14 days

Performing Laboratory Location
Rochester

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.

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CPT Code Information

82570
80349
G0480, if appropriate

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
THCCR	THC-COOH/Creatinine Ratio, U	19055-3

Result ID	Test Result Name	Result LOINC® Value
CRETR	Creatinine, Random, U	2161-8
616334	Delta-9 Carboxy-Tetrahydrocannabinol by LC-MS/MS	20521-1
616335	Carboxy-THC Interpretation	69050-3
616336	THC-COOH/Creatinine Ratio	19055-3