

## 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

### Special Instructions

- [Clinical Toxicology CPT Code Client Guidance](#)

### 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 urine 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.

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- Submitting less than 10 mL may compromise the ability to perform all necessary testing.
  - 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	
	Ambient	72 hours	
	Frozen	14 days	

**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 (Positive result is reported with a quantitative result.)

Cutoff concentration by liquid chromatography tandem mass spectrometry:

DELTA-9 CARBOXY-TETRAHYDROCANNABINOL: 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)

<b>Time interval between urine collections (hours)</b>	<b>Maximum ratio (U2/U1)</b>	<b>95% Below (U2/U1)</b>
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

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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 Sunday

### Report Available

2 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

## Test Definition: THCCR

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

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requirements. It has not been cleared or approved by the US Food and Drug Administration.

### CPT Code Information

G0480

82570 (if appropriate for select payers)

80349 (if appropriate for select payers)

[Clinical Toxicology CPT Code Client Guidance](#)

### 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