Test Definition: CITRA

Citrate Excretion, Random, Urine

Overview

Useful For

Diagnosing risk factors for patients with calcium kidney stones using random urine specimens

Monitoring results of therapy in patients with calcium stones or renal tubular acidosis

Profile Information

Test Id	Reporting Name	Available Separately	Always Performed
CITR2	Citrate Concentration, Random, U	No	Yes
CRETR	Creatinine, Random, U	No	Yes
RAT10	Citrate/Creatinine Ratio	No	Yes

Method Name

Enzymatic

NY State Available

Yes

Specimen

Specimen Type

Urine

Ordering Guidance

A timed 24-hour collection is the preferred specimen for measuring and interpreting this urinary analyte. Order CITR / Citrate Excretion, 24 Hour, Urine.
Random collections normalized to urinary creatinine may be of some clinical use in patients who cannot collect a 24-hour specimen, typically small children.

Specimen Required

Patient Preparation: Any drug that causes alkalemia or acidemia may be expected to alter citrate excretion and should be avoided, if possible. The patient must avoid laxative use for 24 hours prior to collection.
Supplies: Sarstedt 5 mL Aliquot Tube (T914)
Container/Tube: Plastic, 5-mL tube
Specimen Volume: 4 mL
Collection Instructions:
1. Collect a random urine specimen.
2. No preservative.

Forms
If not ordering electronically, complete, print, and send a Renal Diagnostics Test Request (T830) with the specimen.

Specimen Minimum Volume
1 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	

Clinical & Interpretive

Clinical Information
Urinary citrate is a major inhibitor of kidney stone formation due in part to binding of calcium in urine. Low urine citrate levels are considered a risk for kidney stone formation. Several metabolic disorders are associated with low urine citrate. Any condition that lowers renal tubular pH or intracellular pH may decrease citrate (eg, metabolic acidosis, increased acid ingestion, hypokalemia, or hypomagnesemia).

Low urinary citrate is subject to therapy by correcting acidosis, hypokalemia, or hypomagnesemia by altering diet or using drugs such as citrate and potassium.

Reference Values
No established reference values.

Interpretation
A low value represents a potential risk for kidney stone formation/growth. Patients with low urinary citrate and new or growing stone formation may benefit from adjustments in therapy known to increase urinary citrate excretion.

Very low citrate levels suggest investigation for the possible diagnosis of metabolic acidosis (eg, renal tubular acidosis).

For children ages 5 to 18, a ratio of less than 0.176 mg citrate/ mg creatinine is below the 5% reference range and considered low.(1)

Cautions
Drugs that lower systemic pH, potassium, and/or magnesium also lower urine citrate and are to be avoided in patients with tendency to form calcium stones. Conversely, drugs that raise systemic pH, potassium, and/or magnesium may raise urine citrate and should be considered when treating patients or interpreting results.

Clinical Reference

1. Srivastava T, Winston MJ, Auron A, Alon US: Urine calcium/citrate ratio in children with hypercalciuric stones. Pediatr Res. 2009 Jul;66(1):85-90. doi: 10.1203/PDR.0b013e3181a2939e
2. Hosking DH, Wilson JW, Liedtke RR, Smith LH, Wilson DM: The urinary excretion of citrate in normal persons and patients with idiopathic calcium urolithiasis. J Lab Clin Med. 1985 Dec;106(6):682-689
3. Lieske JC, Wang X: Heritable traits that contribute to nephrolithiasis. Urolithiasis. 2019 Feb;47(1):5-10. doi: 10.1007/s00240-018-1095-1
4. Lieske JC, Turner ST, Edeh SN, Smith JA, Kardia SL: Heritability of urinary traits that contribute to nephrolithiasis. Clin J Am Soc Nephrol. 2014 May;9(5):943-950

Performance

Method Description
Citric acid in the presence of zinc (2+) at pH 8.2 is catalyzed to oxaloacetate by the enzyme, citrate lyase. Oxaloacetate in the presence of malate dehydrogenase and reduced nicotinamide adenine dinucleotide (NADH) is reduced to malate (II). The citric acid concentration in the reaction mixture can be determined by measuring the disappearance of the light-absorbing NADH(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; 2018:1309-1310)

PDF Report
No

Day(s) Performed
Monday through Saturday

Report Available
Same day/1 to 3 days

Specimen Retention Time
7 days

Performing Laboratory Location
Mayo Clinic Laboratories - Rochester Main Campus

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

82507
82570

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
CITRA	Citrate Excretion, Random, U	13722-4

Result ID	Test Result Name	Result LOINC® Value
CRETR	Creatinine, Random, U	2161-8
CITR2	Citrate Concentration, Random, U	2128-7
RAT10	Citrate/Creatinine Ratio	13722-4