Test Definition: MAGRU

Magnesium/Creatinine Ratio, Random, Urine

Overview

Useful For

Assessing the cause of abnormal serum magnesium concentrations

Determining whether nutritional magnesium loads are adequate

Calculating urinary calcium oxalate and calcium phosphate supersaturation and assessing kidney stone risk.

Profile Information

Test Id	Reporting Name	Available Separately	Always Performed
MCTR1	Magnesium/Creat Ratio, Random, U	No	Yes
MGCO	Magnesium, Random, U	No	Yes
CRETR	Creatinine, Random, U	No	Yes

Method Name

MGCO, CRETR: Colorimetric

MCTR1: Calculation

NY State Available

Yes

Specimen

Specimen Type

Urine

Specimen Required

Supplies: Sarstedt Aliquot Tube 5 mL (T914)

Collection Container/Tube: Plastic urine container

Submission Container/Tube: Plastic, 5-mL tube or a clean, plastic aliquot container with no metal cap or glued insert

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	
	Ambient	72 hours	
	Frozen	30 days	

Clinical & Interpretive

Clinical Information

Magnesium, along with potassium, is a major intracellular cation. Magnesium is a cofactor of many enzyme systems. All adenosine triphosphate-dependent enzymatic reactions require magnesium as a cofactor. Approximately 70% of magnesium ions are stored in bone. The remainder are involved in intermediary metabolic processes; about 70% are present in free form, while the other 30% are bound to proteins (especially albumin), citrates, phosphate, and other complex formers. The serum magnesium level is kept constant within very narrow limits.

Renal handling of magnesium is determined by the combination of filtration and reabsorption. Roughly 70% of the magnesium in plasma is filtered by the glomeruli; 20% to 30% of the filtered magnesium is reabsorbed in the proximal tubule, while less than 5% is reabsorbed in the distal tubule and collecting duct.(1)

Numerous causes of renal magnesium wasting have been identified including (but not limited to) congenital defects (including Barter and Gitelman syndrome), various endocrine disorders (including hyperaldosteronism and hyperparathyroidism), exposure to certain drugs (ie, diuretics, *cis*-platinum, aminoglycoside antibiotics, calcineurin inhibitors), and other miscellaneous causes (including chronic alcohol abuse). Gastrointestinal conditions associated with fat malabsorption and chronic diarrhea can cause fecal magnesium loss and hypomagnesemia.

High levels of plasma magnesium are typically only seen in patients with decreased renal function, after administration of a magnesium load large enough to exceed the kidneys' ability to excrete it, or a combination of the two.(2)

Magnesium is an inhibitor of calcium crystal growth and contributes to urinary calcium oxalate and calcium phosphate supersaturation. However, low urinary magnesium in isolation has not been identified as a common cause of kidney stones, nor has magnesium supplementation been proven as an effective therapy for stone prevention.

Reference Values

1 month-<12 months: 0.10-0.48 mg/mg creat
12 months-<24 months: 0.09-0.37 mg/mg creat
24 months-<3 years: 0.07-0.34 mg/mg creat
3 years-<5 years: 0.07-0.29 mg/mg creat

5 years-<7 years: 0.06-0.21 mg/mg creat
7 years-<10 years: 0.05-0.18 mg/mg creat
10 years-<14 years: 0.05-0.15 mg/mg creat
14 years-<18 years: 0.05-0.13 mg/mg creat
18 years-83 years: 0.04-0.12 mg/mg creat
Reference values have not been established for patients who are younger than 1 month.
Reference values have not been established for patients who are older than 83 years.

Interpretation

Urinary magnesium excretion should be interpreted in concert with serum concentrations.

In the presence of hypomagnesemia, a 24-hour urine magnesium above 24 mg/day or fractional excretion above 0.5% suggests renal magnesium wasting. Lower values suggest inadequate magnesium intake and/or gastrointestinal losses.

In the presence of hypermagnesemia, urinary magnesium levels provide an indication of current magnesium intake.

Lower urinary magnesium excretion increases urinary calcium oxalate and calcium phosphate supersaturation and could contribute to kidney stone risk.

Cautions

Urinary magnesium excretion must be interpreted with caution during periods of intravenous magnesium infusion.

Clinical Reference

1. 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
2. Al Ghamdi SM. Magnesium deficiency: pathophysiologic and clinical overview. Am J Kidney Dis. 1994;24(5):737-752
3. Sutton RA. Abnormal renal magnesium handling. Miner Electrolyte Metab. 1993;19(4-5):232-240

Performance

Method Description

In alkaline solution, magnesium forms a purple complex with xylidyl blue, diazonium salt. The magnesium concentration is measured photometrically via the decrease in xylidyl blue absorbance.(Package insert: Magnesium Gen.2; Roche Diagnostics; 11/2023)

PDF Report

No

Day(s) Performed

Monday through Sunday

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 has been cleared, approved, or is exempt by the US Food and Drug Administration and is used per manufacturer's instructions. Performance characteristics were verified by Mayo Clinic in a manner consistent with CLIA requirements.

CPT Code Information

83735
82570

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
MAGRU	Magnesium/Creat Ratio, Random, U	13474-2

Result ID	Test Result Name	Result LOINC® Value
CRETR	Creatinine, Random, U	2161-8
MGCO	Magnesium, Random, U	19124-7
MCTR1	Magnesium/Creat Ratio, Random, U	13474-2