MAYO CLINIC LABORATORIES

Test Definition: GDU

Gadolinium, 24 Hour, Urine

Overview

Useful For

Assessing chronic exposure and monitoring effectiveness of dialysis in a 24-hour urine collection

Special Instructions

- Urine Preservatives-Collection and Transportation for 24-Hour Urine Specimens
- Metals Analysis Specimen Collection and Transport

Method Name

Inductively Coupled Plasma Mass Spectrometry (ICP-MS)

NY State Available

Yes

Specimen

Specimen Type

Urine

Necessary Information

24-Hour volume (in milliliters) is required.

Specimen Required

Patient Preparation: High concentrations of gadolinium and iodine are known to potentially interfere with most inductively coupled plasma mass spectrometry-based metal tests. If either gadolinium- or iodine-containing contrast media has been administered, **a specimen should not be collected for at least 96 hours**.
Supplies: Urine Tubes, 10 mL (T068)
Container/Tube: Plastic, 10-mL urine tube or clean, plastic aliquot container with no metal cap or glued insert
Specimen Volume: 0.35 mL
Collection Instructions:
1. Collect urine for 24 hours.
2. Refrigerate specimen within 4 hours of completion of 24-hour collection.
3. See Metals Analysis Specimen Collection and Transport for complete instructions.
Additional Information: See Urine Preservatives-Collection and Transportation for 24-Hour Urine Specimens for multiple collections.

Forms

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

Urine Preservative Collection Options

Preservatives must be added or temperature controls applied within 4 hours of completion of the collection.

Ambient (no additive)	OK
Refrigerate (no additive)	Preferred
Frozen (no additive)	OK
50% Acetic Acid	No
Boric Acid	No
Diazolidinyl Urea	No
6M Hydrochloric Acid	OK
6M Nitric Acid	OK
Sodium Carbonate	No
Toluene	No

Specimen Minimum Volume

0.2 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)	28 days	
	Ambient	28 days	
	Frozen	28 days	

Clinical & Interpretive

Clinical Information

Gadolinium is a member of the lanthanide series of the periodic table of elements and is considered a nonessential element. Due to its paramagnetic properties, chelated gadolinium is commonly employed as contrast media (gadolinium-based contrast agents: GBCA) for magnetic resonance imaging and computer tomography scanning.

Gadolinium is primarily eliminated via the kidneys, so exposure can be prolonged in patients with kidney insufficiency. Patients with reduced kidney function and some patients with normal kidney function may exhibit a prolonged gadolinium elimination half-life.

To date the only known adverse health effect related to gadolinium retention is a rare condition called nephrogenic systemic fibrosis (NSF). NSF is a relatively uncommon condition in which fibrous plaques develop in the dermis and often in deeper connective tissues. Reported cases have occurred almost exclusively in patients with severe kidney disease, and almost all have been associated with prior use of GBCA. NSF is a painful skin disease characterized by thickening of the skin, which can involve the joints and cause significant limitation of motion within weeks to months. Over the past decade, changes in clinical practice guidelines have almost eliminated the incidence of NSF. However, the association of

NSF and observed elevated gadolinium concentrations is still not fully understood.

Reference Values

0-17 years: Not established

> or =18 years: <1.1 mcg/24 h

Interpretation

Elevated urine gadolinium results from a specimen collected more than 96 hours after administration of a gadolinium-based contrast agent confirms past exposure or continued exposure through anthropogenic sources and prolonged elimination of gadolinium. Gadolinium also has been shown to be present in some municipal water sources, which may contribute to the observation of low concentrations of gadolinium in patients who have never been exposed to gadolinium-based contrast agents.

Elevated gadolinium in a specimen collected more than 96 hours after contrast media infusion does not indicate risk of nephrogenic systemic fibrosis.

Cautions

The current reference interval was established using healthy individuals with no recent exposure to gadolinium. A recent study found that 95% of patients who received gadobutrol-enhanced magnetic resonance imaging (MRI) did not show urine gadolinium concentrations below the unexposed reference interval (<0.8 mcg/g creatinine) until approximately 132 days after imaging.(1)

This elevation is due to the residual gadolinium present from contrast media infusion. An elevated gadolinium in a specimen collected after contrast media infusion does not definitively indicate risk of nephrogenic systemic fibrosis or gadolinium toxicity. Ultimately, individuals should consult with their healthcare professionals to interpret any test results.

Gadolinium may also be present in the effluent of metropolitan sewage treatment plants and in the rivers near metropolitan areas. Sewage treatment does not remove gadolinium. Anthropogenic sources of gadolinium could contribute to low concentrations of gadolinium excreted in the urine.

Supportive Data

An evaluation of urine gadolinium concentration in healthy human subjects not exposed to gadolinium within 96 hours of specimen collection generated a reference range of less than 0.7 mcg/24 hours with no evidence of age or gender trend.

Clinical Reference

1. McDonald JS, Day PL, Spears GM, Bornhorst JA, McDonald RJ, Jannetto PJ. Serum and urine gadolinium reference intervals in patients with normal renal function following gadobutrol administration. Invest Radiol. 2025;60(9):586-591. doi:10.1097/RLI.0000000000001165
2. Christensen KN, Lee CU, Hanley MM, Leung N, Moyer TP, Pittelkow MR. Quantification of gadolinium in fresh skin and serum samples from patients with nephrogenic systemic fibrosis. J Am Acad Dermatol. 2011;64(1):91-96
3. Telgmann L, Sperling M, Karst U. Determination of gadolinium-based MRI contrast agents in biological and environmental samples: A review. Anal Chim Acta. 2013;764:1-16
4. Daftari Besheli L, Aran S, Shaqdan K, Kay J, Abujudeh H. Current status of nephrogenic systemic fibrosis. Clin Radiol.

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5. Aime S, Caravan P. Biodistribution of gadolinium-based contrast agents, including gadolinium deposition. J Magn Reson Imaging. 2009;30(6):1259-1267
6. McDonald RJ, McDonald JS, Kallmes DF, et al. Intracranial gadolinium deposition after contrast-enhanced MR imaging. Radiology. 2015;275(3):772-782
7. Attari H, Cao Y, Elmholdt TR, Zhao Y, Prince MR. A systematic review of 639 patients with biopsy-confirmed nephrogenic systemic fibrosis. Radiology. 2019;292(2):376-386
8. Woolen SA, Shankar PR, Gagnier JJ, MacEachern MP, Singer L, Davenport MS. Risk of nephrogenic systemic fibrosis in patients with stage 4 or 5 chronic kidney disease receiving a group II gadolinium-based contrast agent: A systematic review and meta-analysis. JAMA Intern Med. 2020;180(2):223-230
9. Bornhorst J, Wegwerth P, Day P, et al. Urinary reference intervals for gadolinium in individuals without recent exposure to gadolinium-based contrast agents. Clin Chem Lab Med. 2020;58(3):e87-e90
10. Alwasiyah D, Murphy C, Jannetto P, Hogg M, Beuhler MC. Urinary gadolinium levels after contrast-enhanced MRI in individuals with normal renal function: a pilot study. J Med Toxicol. 2019;15(2):121-127
11. Othersen JB, Maize JC, Woolson RF, Budisavljevic MN. Nephrogenic systemic fibrosis after exposure to gadolinium in patients with renal failure. Nephrol Dial Transplant. 2007;22(11):3179-3185

Performance

Method Description
The metal of interest is analyzed by inductively coupled plasma mass spectrometry.(Unpublished Mayo method)

PDF Report
No

Day(s) Performed
Thursday

Report Available
2 to 8 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 requirements. It has not been cleared or approved by the US Food and Drug Administration.

CPT Code Information

83018

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
GDU	Gadolinium, 24 Hr, U	8201-6

Result ID	Test Result Name	Result LOINC® Value
29252	Gadolinium, 24 Hr, U	8201-6
TM101	Collection Duration (h)	13362-9
VL82	Volume (mL)	3167-4