

Overview

Useful For

Detecting exposure to cadmium, a toxic heavy metal, in 24-hour urine specimens

Special Instructions

- [Urine Preservatives-Collection and Transportation for 24-Hour Urine Specimens](#)
- [Metals Analysis Specimen Collection and Transport](#)

Method Name

Triple-Quadrupole Inductively Coupled Plasma Mass Spectrometry (ICP-MS/MS)

NY State Available

Yes

Specimen

Specimen Type

Urine

Ordering Guidance

If employees are being monitored in the workplace, OSHA requires that laboratory reports express the cadmium excretion rate per gram of creatinine rather than per 24 hours. Order CDUOE / Cadmium, Occupational Exposure, Random, Urine to accommodate that requirement. Mayo Clinic Laboratories is certified to provide this test.

Necessary Information

24-Hour volume (in milliliters) is required.

Specimen Required

Patient Preparation:

1. For the 48-hour period prior to start of collection, as well as during the collection, patient **should not** eat seafood.
2. 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 96 hours.**

Supplies: Urine Tubes, 10 mL (T068)

Collection Container/Tube: Clean, plastic urine container with no metal cap or glued insert

Submission Container/Tube: Plastic, 10-mL urine tube or clean, plastic aliquot container with no metal cap or glued insert

Specimen Volume: 3 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.

Urine Preservative Collection Options

Note: The addition of preservative or application of temperature controls **must occur within 4 hours of completion** of the collection.

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

Specimen Minimum Volume

1.5 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

The toxicity of cadmium resembles the other heavy metals (arsenic, mercury, and lead) in that it attacks the kidney; kidney dysfunction with proteinuria and a slow onset (over a period of years) is the typical presentation. Measurable changes in proximal tubule function, such as decreased clearance of para-aminohippuric acid also occur over a period of years and precede overt kidney failure.

Breathing the fumes of cadmium vapors leads to nasal epithelial deterioration and pulmonary congestion resembling chronic emphysema.

For nonsmokers, the primary source of cadmium exposure is from the food supply. In general, leafy vegetables such as lettuce and spinach, potatoes and grains, peanuts, soybeans, and sunflower seeds contain high levels of cadmium. For smokers, the most common source of cadmium exposure is tobacco smoke, which has been implicated as the primary sources of the metal leading to reproductive toxicity in both men and women.

The concentration of cadmium in the kidneys and urine is elevated in some patients exposed to cadmium.

Reference Values

0-17 years: Not established

> or =18 years: <0.7 mcg/24 h

Interpretation

Urine cadmium levels primarily reflect total body burden of cadmium. Cadmium excretion above 3.0 mcg/g creatinine indicates significant exposure to cadmium.

For occupational testing, OSHA cadmium standard is less than 3.0 mcg/g creatinine, and the biological exposure index is 5.0 mcg/g creatinine.

Collection of urine over 24 hours minimizes fluctuations of observed cadmium concentrations in random urine samples.

Cautions

Collection of urine specimens through a catheter frequently results in elevated values because rubber contains trace amounts of cadmium that are extracted as urine passes through the catheter.

Clinical Reference

1. de Burbure C, Buchet JP, Leroyer A, et al. Renal and neurologic effects of cadmium, lead, mercury, and arsenic in children: evidence of early effects and multiple interactions at environmental exposure levels. *Environ Health Perspect*. 2006;114(4):584-590
2. Schulz C, Angerer J, Ewers U, Heudorf U, Wilhelm M; Human Biomonitoring Commission of the German Federal Environment Agency. Revised and new reference values for environmental pollutants in urine or blood of children in Germany derived from the German Environmental Survey on Children 2003-2006(GerESIV). *Int J Hyg Environ Health*. 2009;212(6):637-647
3. Occupational Safety and Health Administration. Cadmium exposure and control. Updated 09/02/2008. Accessed August 30, 2024. US Department of Labor Available at [osha.gov/SLTC/cadmium/evaluation.html](https://www.osha.gov/SLTC/cadmium/evaluation.html)
4. Agency for Toxic Substances and Disease Registry. Toxicological profile for cadmium. US Department of Health and Human Services. September 2012. Available at www.atsdr.cdc.gov/ToxProfiles/tp5.pdf
5. Strathmann FG, Blum LM. Toxic elements. In: Rifai N, Chiu RWK, Young I, Burnham CD, Wittwer CT, eds. *Tietz Textbook of Laboratory Medicine*. 7th ed. Elsevier; 2023:chap 44
6. Zhang H, Reynolds M. Cadmium exposure in living organisms: A short review. *Sci Total Environ*. 2019;678:761-767. doi:10.1016/j.scitotenv.2019.04.395

Performance

Method Description

The metal of interest is analyzed by triple-quadrupole inductively coupled plasma mass spectrometry.(Unpublished Mayo method)

PDF Report

No

Day(s) Performed

Monday through Friday

Report Available

1 to 3 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

82300

LOINC® Information

| Test ID | Test Order Name | Order LOINC® Value |
|---------|-------------------|--------------------|
| CDU | Cadmium, 24 Hr, U | 5612-7 |

| Result ID | Test Result Name | Result LOINC® Value |
|-----------|-------------------------|---------------------|
| 31106 | Cadmium, 24 Hr, U | 5612-7 |
| TIME7 | Collection Duration (h) | 13362-9 |

| | | |
|------|-------------|--------|
| VL83 | Volume (mL) | 3167-4 |
|------|-------------|--------|