MAYO CLINIC LABORATORIES

Test Definition: CRU

Chromium, 24 Hour, Urine

Overview

Useful For

Screening for occupational exposure to chromium

Monitoring metallic prosthetic implant wear

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

Ordering Guidance

High concentrations of gadolinium and iodine are known to interfere with most metal tests. If either gadolinium- or iodine-containing contrast media has been administered, a specimen should not be collected for 96 hours.

Specimen Required

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: 0.5 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:
1. 24-Hour volume is required.
2. 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	OK
Refrigerate	Preferred
Frozen	OK
50% Acetic Acid	No
Boric Acid	No
Diazolidinyl Urea	No
6M Hydrochloric Acid	No
6M Nitric Acid	No
Sodium Carbonate	No
Thymol	No
Toluene	No

Specimen Minimum Volume

0.3 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

Chromium (Cr) exists in valence states. Hexavalent chromium (Cr[6+]) and trivalent chromium (Cr[3+]) are the 2 most prevalent forms. Cr(6+) is used in industry to make chromium alloys including stainless steel, pigments, and electroplated coatings. Cr(6+), a known carcinogen, is immediately converted to Cr(3+) upon exposure to biological tissues. Cr(3+) is the only chromium species found in biological specimens.

Urine chromium concentrations are likely to be increased above the reference range in patients with metallic joint prosthesis. Prosthetic devices produced by DePuy Company, Dow Corning, Howmedica, LCS, PCA, Osteonics, Richards Company, Tricon, and Whiteside typically are made of chromium, cobalt, and molybdenum. This list of products is incomplete, and these products change occasionally; see prosthesis product information for each device for composition details.

Reference Values

0-17 years: Not established

> or =18 years: 0.1-1.2 mcg/24 hours

Interpretation

Chromium is principally excreted in the urine. Urine levels correlate with exposure. Results greater than the reference range indicate either recent exposure to chromium or specimen contamination during collection.

Prosthesis wear is known to result in increased circulating concentration of metal ions. Modest increase (8-16 mcg/24 hour) in urine chromium concentration is likely to be associated with a prosthetic device in good condition. Urine concentrations greater than 20 mcg/24 hours in a patient with chromium-based implant suggest significant prosthesis wear. Increased urine trace element concentrations in the absence of corroborating clinical information do not independently predict prosthesis wear or failure.

The National Institute for Occupational Safety and Health draft document on occupational exposure reviews the data supporting use of urine to assess chromium exposure. They recommend a Biological Exposure Index of 10 mcg/g creatinine and 30 mcg/g creatinine for the increase in urinary chromium concentrations during a work shift and at the end of shift at the end of the workweek, respectively. A test for this specific purpose (CRUO / Chromium Occupational Exposure, Random, Urine) is available.

Cautions

Normal specimens have extremely low levels of chromium; because of the ubiquitous nature of chromium, elevated results could easily be a result of external contamination. Precautions must be taken to ensure the specimen is not contaminated. Metal-free urine collection procedures must be followed (see Metals Analysis Specimen Collection and Transport).

Refrigeration is preferred over chemical methods of preservation.

Clinical Reference

1. Vincent JB. Elucidating a biological role for chromium at a molecular level. Acc Chem Res. 2000;33(7):503-510
2. Centers for Disease Control and Prevention, The National Institute for Occupational Safety and Health (NIOSH): Criteria for a Recommended Standard for an Occupational Exposure to Hexavalent Chromium. September 2013. Accessed July 22, 2022. CDC; Available at www.cdc.gov/niosh/docs/2013-128/pdfs/2013_128.pdf
3. Keegan GM, Learmonth ID, Case CP. A systematic comparison of the actual, potential, and theoretical health effects of cobalt and chromium exposures from industry and surgical implants. Crit Rev Toxicol. 2008;38:645-674
4. Sodi R. Vitamins and trace elements. In: Rifai N, Chiu RWK, Young I, eds: Tietz Textbook of Laboratory Medicine. 7th ed. Elsevier; 2023:chap 39
5. Eliaz N. Corrosion of metallic biomaterials: A review. Materials (Basel). 2019;12(3):407. doi: 10.3390/ma12030407
6. US Food and Drug Administration. Information about Soft Tissue Imaging and Metal Ion Testing. FDA; Updated March 15, 2019. Accessed March 2, 2021. Available at www.fda.gov/MedicalDevices/ProductsandMedicalProcedures/ImplantsandProsthetics/MetalonMetalHipImplants/ucm331971.htm

Performance

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

PDF Report
No

Day(s) Performed
Tuesday, Wednesday, Friday

Report Available
1 to 4 days

Specimen Retention Time
14 days

Performing Laboratory Location
Rochester

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
82495

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
CRU	Chromium, 24 Hr, U	5624-2

Result ID	Test Result Name	Result LOINC® Value
8593	Chromium, 24 Hr, U	5624-2
TM44	Collection Duration	13362-9
VL42	Urine Volume	3167-4