MAYO CLINIC LABORATORIES

Test Definition: CRS

Chromium, Serum

Overview

Useful For

Screening for occupational exposure

Monitoring metallic prosthetic implant wear

Special Instructions

- 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

Serum

Ordering Guidance

The US Food and Drug Administration recommended test for monitoring chromium in patients with metal-on-metal implants is CRWB / Chromium, Blood.

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 96 hours**.

Supplies:

-Metal Free B-D Tube (No Additive), 6 mL (T184)

-Metal Free Specimen Vial (T173)

Collection Container/Tube: 6 mL Plain, royal blue-top Vacutainer plastic trace element blood collection tube

Submission Container/Tube: 7-mL Mayo metal-free, screw-capped, polypropylene vial

Specimen Volume: 1.6 mL Serum

Collection Instructions: See Metals Analysis Specimen Collection and Transport for complete instructions.

Specimen Minimum Volume

Serum: 0.3 mL

Reject Due To

Gross hemolysis	OK
Gross lipemia	OK
Gross icterus	OK

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Serum	Refrigerated (preferred)	28 days	METAL FREE
	Ambient	28 days	METAL FREE
	Frozen	28 days	METAL FREE

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.

Serum Cr 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

<0.4 ng/mL

When collected by a phlebotomist experienced in ultra-clean collection technique and handled according to the instructions in Metals Analysis Specimen Collection and Transport, we have observed the concentration of chromium in serum to be below 0.4 ng/mL. However, the majority of specimens submitted for analysis from unexposed individuals contain 0.1 ng/mL to 0.3 ng/mL of chromium. Commercial evacuated blood collection tubes not designed for trace-metal specimen collection yield serum containing 2.0 ng/mL to 5.0 ng/mL chromium derived from the collection tube.

Interpretation

Results greater than the flagged value indicates clinically significant exposure to chromium (Cr) (see Cautions about specimen collection). The reported units of measurement for chromium of ng/mL are equivalent to mcg/L.

Prosthesis wear is known to result in an increased circulating concentration of metal ions. A modest increase (0.3-0.6 ng/mL) in serum Cr concentration is likely to be associated with a prosthetic device in good condition. Serum concentrations above 1 ng/mL in a patient with a Cr-based implant suggest significant prosthesis wear. Increased serum trace element concentrations in the absence of corroborating clinical information do not independently predict prosthesis wear or failure. However, the US Food and Drug Administration recommends testing chromium in EDTA

anticoagulated whole blood in symptomatic patients with metal-on-metal implants.

Cautions

Specimens from unexposed individuals collected using metal-free collection procedures typically contain 0.1 ng/mL to 0.3 ng/mL of chromium. Chromium is present in our environment at 100-fold to 1000-fold higher concentration than found in biological tissues. Reports of increased serum chromium could be due to external contamination. Metal-free serum collection procedures must be followed, and centrifuged serum must be aliquoted into a Mayo Clinic Laboratories metal-free vial to avoid external contamination. Specimens collected using an anticoagulant are unacceptable; trace amounts of chromium are present in anticoagulants used in evacuated collection tubes.

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 March 18, 2026. 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(8):645-674
4. Tower SS. Arthroprosthetic cobaltism: Neurological and cardiac manifestations in two patients with metal-on-metal arthroplasty: A case report. J Bone Joint Surg Am. 2010;92(17):2847-2851
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 18, 2026. Available at www.fda.gov/MedicalDevices/ProductsandMedicalProcedures/ImplantsandProsthetics/MetalonMetalHipImplants/ucm331971.htm
7. Sodi R. Vitamins and trace elements. Rifai N, Chiu RWK, Young I, eds. Tietz Textbook of Laboratory Medicine. 7th ed. Elsevier; 2023:chap 39

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 4 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

82495

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
CRS	Chromium, S	5622-6

Result ID	Test Result Name	Result LOINC® Value
8638	Chromium, S	5622-6