MAYO CLINIC LABORATORIES

Test Definition: HGUCR

Mercury/Creatinine Ratio, Random, Urine

Overview

Useful For

Detecting mercury toxicity, a toxic heavy metal, using random urine specimens

Profile Information

Test Id	Reporting Name	Available Separately	Always Performed
HGCU	Mercury/Creatinine Ratio, U	No	Yes
CRETR	Creatinine, Random, U	No	Yes

Special Instructions

- Metals Analysis Specimen Collection and Transport

Method Name

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

CRETR: Enzymatic Colorimetric Assay

NY State Available

Yes

Specimen

Specimen Type

Urine

Specimen Required

Patient Preparation:

1. For 48 hours before 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 a random urine specimen.

2. See Metals Analysis Specimen Collection and Transport for complete instructions.

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)	7 days	
	Frozen	7 days	

Clinical & Interpretive

Clinical Information

The correlation between the levels of mercury (Hg) excretion in the urine and the clinical symptoms is considered poor.

Previous thought indicated urine as a more appropriate marker of inorganic mercury because organic mercury represented only a small fraction of urinary mercury. Based on possible demethylation of methylmercury within the body, urine may represent a mixture of dietary methylmercury and inorganic mercury. Seafood consumption can contribute to urinary mercury levels (up to 30%),(1) which is consistent with the suggestion that due to demethylation processes in the human body, a certain proportion of urinary mercury can originate from dietary consumption of fish/seafood.(2)

Small amounts of mercury are often present in urine, often stemming from environmental exposure or from dental amalgam. The amount of mercury in urine depends upon the form of mercury, the level and duration of mercury exposure, and the elapsed time between exposure and urine sample collection.

For potential mercury vapor exposure: urine mercury levels are unlikely to be useful for assessing potential health effects from short-term, low-level exposures to mercury vapor because such exposures are unlikely to result in mercury urine levels elevated above typical values. High level mercury vapor exposure or long-term, low-level vapor exposures may result in elevated urine mercury levels, which can indicate potential for health effects. Random urine mercury level is adjusted to concentration of creatinine.

Urine mercury concentrations in unexposed individuals are typically less than 10 mcg/L (50 nmol/L) or 2 mcg/g creatinine. Twenty-four-hour urine concentrations of 30 mcg/L to 100 mcg/L (150-499 nmol/L) may be associated with subclinical neuropsychiatric symptoms and tremor, while concentrations greater than 100 mcg/L (499 nmol/L) can be associated with overt neuropsychiatric disturbances and tremors.(4)

Mercury concentrations of greater than 10 mcg/g creatinine may associate with subtle effects on visual memory, attention, manual coordination, mood, increased levels of fatigue and confusion. Higher level of urine mercury is associated with increasing frequent and severe nervous system changes in personality, cognition, and coordination.(3)

Mercury concentrations of 20 mcg/g to 35 mcg/g creatinine may be associated with hand tremors and potential kidney damage.(3)

Reference Values

MERCURY/CREATININE:
<18 years: Not established
> or =18 years: <2 mcg/g creatinine

CREATININE:
<18 years: Not established
> or =18 years: 16-326 mg/dL

Interpretation

Daily urine excretion of mercury above 50 mcg/day indicates significant exposure (per World Health Organization standard).

Cautions

To avoid contamination by dust, specimen should be collected away from the site of suspected exposure.

Clinical Reference

1. Snoj Tratnik J, Falnoga I, Mazej D, et al. Results of the first national human biomonitoring in Slovenia: Trace elements in men and lactating women, predictors of exposure and reference values. Int J Hyg Environ Health. 2019;222(3):563-582
2. Sherman LS, Blum JD, Franzblau A, Basu N. New insight into biomarkers of human mercury exposure using naturally occurring mercury stable isotopes. Environ Sci Technol. 2013;47(7):3403-3409
3. McKelvey W, Alex B, Chernov C, et al. Tracking Declines in Mercury Exposure in the New York City Adult Population, 2004-2014. J Urban Health. 2018;95(6):813-825
4. Agency for Toxic Substances and Disease Registry. Atsdr - addendum to the toxicological profile: Mercury. 2022.
5. Lee R, Middleton D, Caldwell K, et al. A review of events that expose children to elemental mercury in the United States. Environ Health Perspect. 2009;117(6):871-878
6. Bjorkman L, Lundekvam BF, Laegreid T, et al. Mercury in human brain, blood, muscle and toenails in relation to exposure: an autopsy study. Environ Health. 2007;6:30
7. Bernhoft RA. Mercury toxicity and treatment: a review of the literature. J Environ Public Health. 2012;2012:460508. doi:10.1155/2012/460508
8. 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

Performance

Method Description

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

Creatinine:
This enzymatic method is based on the conversion of creatinine with the aid of creatininase, creatinase, and sarcosine oxidase to form glycine, formaldehyde, and hydrogen peroxide. Catalyzed by peroxidase the liberated hydrogen peroxide reacts with 4-aminophenazone and HTIB (2,4,6-triiodo03-hydroxybenzoic acid) to form a quinone imine chromogen. The color intensity of the quinone imine chromogen formed is directly proportional to the creatinine concentration in the reaction mixture.(Package insert: Creatinine plus ver.2. Roche Diagnostics; 07/2024)

PDF Report
No

Day(s) Performed
Monday through Friday

Report Available
2 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
83825
82570

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
HGUCR	Mercury/Creat Ratio, Random,U	13465-0

Result ID	Test Result Name	Result LOINC® Value
CRETR	Creatinine, Random, U	2161-8

608903	Mercury/Creatinine Ratio, U	13465-0